THIRD SERIES VOL 64 NUMBER 9 JULY 1957

THE JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

66 PORTLAND PLACE LONDON W1 · TWO SHILLINGS AND SIXPENCE

The Sheldonian Theatre, one of the historic Oxford buildings for the repair of which an appeal has been launched

THE JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

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Council Election Results

Report to the Chairman of the General Meeting, Tuesday 18 June 1957

The Scrutineers appointed to count the votes for the election of the Council for the Session 1957–1958 *beg to report as follows:*

4,686 *Voting Papers were received of which* 70 *were invalid.*

In addition 45 *envelopes were received which were invalid* (12 *unsigned,* 33 *unstamped*).

The result of the election is as follows:

COUNCIL 1957–1958

President

KENNETH MERVYN BASKERVILLE CROSS (unopposed)

Past Presidents

CHARLES HERBERT ASLIN (Hertford) (unopposed)
ANDREW GRAHAM HENDERSON (Glasgow) (unopposed)

Fellow Members of Council

Elected		*Votes*
1.	PROFESSOR BASIL SPENCE	2,023
2.	FREDERICK GIBBERD	1,661
3.	HUBERT BENNETT	1,585

Associate Members of Council

Elected		*Votes*
1.	DONALD EVELYN EDWARD GIBSON	2,631
2.	PETER FAULKNER SHEPHEARD	2,031
3.	STIRRAT ANDREW WILLIAM JOHNSON-MARSHALL	1,338

Licentiate Member of Council

Elected		*Votes*
1.	GWYN HENRY MORRIS	2,627

Ordinary Members of Council

Elected		*Class of Membership*	*Votes*
1.	PROFESSOR ROBERT JOSEPH GARDNER-MEDWIN	[*F*]	1,322
2.	HARRY DURELL	[*L*]	1,232
3.	PERCY EDWIN ALAN JOHNSON-MARSHALL	[*A*]	1,199

Candidates Not Elected

		Class of Membership	*Votes*
1.	WILLIAM EDEN TATTON BROWN	[*A*]	1,130
2.	GONTRAN ICETON GOULDEN	[*A*]	1,068
3.	CECIL GEORGE STILLMAN	[*F*]	1,052
4.	JOHN HENRY FORSHAW	[*F*]	987
5.	THURSTON MONIER WILLIAMS	[*A*]	890
6.	BRYAN PERCY WESTWOOD	[*F*]	888
7.	CLIFFORD EWART CULPIN	[*F*]	824
8.	SIDNEY EDWARD THOMAS CUSDIN	[*A*]	785
9.	HERBERT JOHN WHITFIELD LEWIS	[*A*]	781
10.	ROBERT MACKELLAR	[*A*]	780
11.	CECIL MAX LOCK	[*F*]	771
12.	RICHARD LLEWELYN DAVIES	[*F*]	766
13.	ALEXANDER STEELE	[*A*]	759
14.	HARRY JUDSON	[*A*]	725
15.	HOWARD VICARS LOBB	[*F*]	708
16.	CECIL HOWITT	[*F*]	702
17.	FREDERICK BERNARD POOLEY	[*F*]	684
18.	CHARLES HOWARD SIMMONS	[*A*]	655
19.	PETER BROWNING DUNHAM	[*F*]	650
20.	ALDWYN DOUGLAS JONES	[*F*]	647
21.	ANTHONY POTT	[*A*]	606
22.	STANLEY WAYMAN MILBURN	[*F*]	527
23.	ALBERT EDWARD THURMAN MATTHEWS	[*A*]	452
24.	HENRY RONALD EWART KNIGHT	[*A*]	450
25.	SAMUEL ERNEST URWIN	[*F*]	395
26.	HAROLD BRUCE ALLSOPP	[*F*]	389
27.	DONALD HANKS MCMORRAN	[*F*]	357
28.	ROBERT FORBES HUTCHISON	[*F*]	343
29.	PAUL VICTOR EDISON MAUGER	[*F*]	329
30.	CYRIL FRANCIS BATES	[*F*]	327
31.	CHARLES HERBERT BINGHAM-POWELL	[*A*]	251
32.	ISAAC CHAIKIN	[*A*]	218
33.	CYRIL FREDERICK JAMES THURLEY	[*F*]	213
34.	RONALD OWEN VINE	[*F*]	194
35.	CHARLES STANLEY WHITE	[*F*]	173
36.	LEWIS JAMES FREMEN GOMME	[*F*]	170
37.	GEORGE WILLIAM KNIGHT	[*F*]	112

Representatives of Allied Societies in the United Kingdom or the Republic of Ireland

(1) *Six Representatives from the Northern Province of England*

DONALD MCINTYRE [*F*] (Northern Architectural Association)

ROBERT MACKISON MCNAUGHT [*F*] (Manchester Society of Architects)

LESLIE WILLIAM MACBRYDE ALEXANDER [*A*] (Liverpool Architectural Society)

CECIL LECKENBY [*F*] (York and East Yorkshire Architectural Society)

NORMAN HAROLD FOWLER [*F*] (West Yorkshire Society of Architects)

HARRY BECKETT SWIFT GIBBS [*F*] (Sheffield, South Yorkshire and District Society of Architects and Surveyors)

(2) *Five Representatives from the Midland Province of England*

HERBERT JACKSON [*F*] (Birmingham and Five Counties Architectural Association)

ERNEST WILLIAM PARKINSON [*L*] (Leicestershire and Rutland Society of Architects)

HAROLD ARTHUR ROLLS [*L*] (Northamptonshire, Bedfordshire and Huntingdonshire Association of Architects)

STANLEY FRANCIS BARRELL [*A*] (Nottingham, Derby and Lincoln Society of Architects)

BIRKIN HAWARD [*A*] (East Anglian Society of Architects)

(3) *Six Representatives from the Southern Province of England*

AILWYN GEOFFREY BAZELEY [*F*] (Devon and Cornwall Society of Architects)

ROBERT FRANCIS FAIRHURST [*A*] (Wessex Federal Society of Architects)

COLIN COOPER [*A*] (Berks, Bucks and Oxon Architectural Association)

PETER MCGEOCH CORSAR [*F*] (Hampshire and Isle of Wight Architectural Association)

LAURENCE JOHN SELBY [*F*] (Essex, Cambridge and Hertfordshire Society of Architects)

ROBERT DUNCAN SCOTT [*F*] (South Eastern Society of Architects)

(4) *Four Representatives of Allied Societies in Scotland to be nominated by the Council of the Royal Incorporation of Architects in Scotland*

THOMAS SMITH CORDINER [*F*] (Glasgow)

JAMES ALLAN HUGH MOTTRAM [*A*] (Edinburgh)

THOMAS HILL THOMS [*F*] (Dundee)

JAMES ANDREW CARRICK [*F*] (Ayre)

(5) *One Representative of Allied Societies in Wales*

CYRIL AUBREY HUGHES [*L*] (South Wales Institute of Architects)

(6) *Two Representatives of Allied Societies in Ireland*

WILFRID JOHN CANTWELL [*F*] (Royal Institute of the Architects of Ireland)

JOHN DENIS MCCUTCHEON [*L*] (Royal Society of Ulster Architects)

Representatives of Societies in Alliance with the Royal Institute Overseas

ARTHUR JAMES CARMAN PAINE [*F*] (Royal Architectural Institute of Canada)

THOMAS EDWARD SCOTT [*F*] (Representative in the United Kingdom)

EDWARD JAMES ARCHIBALD WELLER [*F*] (Royal Australian Institute of Architects)

ANDREW GRAHAM HENDERSON [*F*] (Representative in the United Kingdom)

GEORGE RONALD COLIN MUSTON [*A*] (The New Zealand Institute of Architects)

REGINALD HAROLD UREN [*F*] (Representative in the United Kingdom)

COLIN MACDONALD SINCLAIR [*A*] (The Institute of South African Architects)

MICHAEL THEODORE WATERHOUSE [*F*] (Representative in the United Kingdom)

To be appointed. (The Indian Institute of Architects)

STUART BENTLEY [*F*] (Representative in the United Kingdom)

Representative of the Architectural Association (London)

JOHN BRANDON-JONES [*A*]

Representative of the Association of Building Technicians

KENNETH JOHN CAMPBELL [*A*]

Chairman of the Board of Architectural Education

RODERICK EUSTACE ENTHOVEN [*F*]

Chairman of the R.I.B.A. Registration Committee

STANLEY VINCENT GOODMAN [*F*]

Two Representatives of the R.I.B.A. Salaried and Official Architects' Committee

To be appointed

Chairman of the R.I.B.A. Allied Societies' Conference

HAROLD CONOLLY [*F*] (Chelmsford)

Election of Two Honorary Auditors

JOHN CLIFFORD RATCLIFF [*F*]

DAVID WATERHOUSE [*A*]

Scrutineers

JOHN J. ADAMS
F. STEVEN ALEXANDER
E. HUNWICK BOOBYER
LAWRENCE A. BUTTERFIELD
E. A. DULEY
D. MURRAY EVANS
S. H. FISK
ALEXANDER FLINDER
G. R. GLENNY
MAXWELL C. GRAY
RONALD HARDY
R. BADEN HELLARD
DAVID HUBERT
ERIC HUGHES
J. C. KENNEDY
FRANCIS KERR
A. J. NORCLIFFE
N. C. NULLIS
D. S. PEARCE
M. V. F. POORE
NORMAN RIX
N. A. ROYCE
MAURICE H. RUSSELL
F. A. M. SELLEY
W. A. SHERRINGTON
THOMAS SIBTHORP
R. E. SUMMERS
RUSSELL G. D. VERNON
ERIC H. FIRMIN, *Chairman*

R.I.B.A. Officers 1957–58

The Council at their meeting on 2 July appointed honorary officers for the session 1957 to 1958.

Mr. Harold Conolly, C.B.E. [*F*] (Chelmsford), having been re-appointed Chairman of the Allied Societies Conference for the Session, remains a Vice-President under the provisions of Bye-law 28.

The Council re-appointed Mr. Leonard C. Howitt, M.T.P.I. [*F*] (Manchester), and Mr. Thomas E. Scott, C.B.E. [*F*], as Vice-Presidents, and appointed Mr. J. H. Forshaw, C.B., M.C. [*F*], as the fourth Vice-President in succession to Professor Sir Leslie Martin.

Professor Basil Spence, O.B.E., A.R.A., A.R.S.A. [*F*], and Mr. E. D. Jefferiss Mathews, O.B.E., A.R.I.C.S. [*F*], were re-appointed Hon. Secretary and Hon. Treasurer respectively.

Birthday Honours List

Baronet. Rt. Hon. Henry Urmston Willink, Q.C. [*Hon. A*].

Knight Bachelor. Professor J. Leslie Martin (Vice-President, R.I.B.A.).

C.B.E. F. C. Hawkes, Secretary, Chartered Auctioneers' and Estate Agents' Institute. S. Hudson, Past President, National Federation of Building Trades Employers. J. E. R. G. Kean [*A*], Director of Works and Services (Scotland), Ministry of Works. M. C. Tebbitt [*A*]. B. S. Townroe [*Hon. A*]. G. Grey Wornum [*F*] (Deceased).

O.B.E. G. Ford [*F*], Assistant Chief Architect, Ministry of Works. S. Colwyn Foulkes [*F*]. M. J. Hellier, County Planning Officer, Derbyshire: President, Town Planning Institute. H. A. Metayers [*F*], Senior Architect, Home Office. A. D. Parham [*F*], Deputy Chief Housing and Planning Inspector, Ministry of Housing and Local Government. G. Weston, Technical Director, British Standards Institution.

M.B.E. Mrs. Winifred Dance, Secretary, Society for the Protection of Ancient Buildings. R. C. Rose, Director, Historic Buildings Bureau, Ministry of Works. Miss E. M. Rutland, First Assistant Secretary, R.I.C.S. S. H. Schwartzel [*A*], Uganda. G. G. L. Tyte [*A*].

Grey Wornum

The news of Mr. Grey Wornum's death on 11 June in New York was received too late to be recorded in the June JOURNAL. The grief of his many friends was tempered by the thought that his heart must have been gladdened by the award of the C.B.E. in the Birthday Honours and that his long illness was at an end.

In the R.I.B.A. Building his name and gifts are perpetuated. The photograph was taken when he was laying the last stone on No. 66, and was kindly offered to the JOURNAL by Mr. H. W. Bush, Master Mason, who is immediately behind Mr. Wornum in the photograph and who is at the present time busy on No. 68.

Sir Ian MacAlister

A memorial service for Sir Ian MacAlister was held at All Souls, Langham Place, on 28 June. The Rev. C. J. E. Lefroy officiated, and Mr. Kenneth M. B. Cross, President R.I.B.A., read the Lesson.

Among the congregation were: Mr. A. R. M. MacAlister (son), Mr. and Mrs. A. D. Divine (son-in-law and daughter), Mrs. H. T. Spowart, Mrs. J. M. McNeill and Mrs. J. Ambrose (daughters), Miss A. Seaton, Mrs. Charles MacAlister, Mrs. Paul Lingeman and Mrs. Vere Benson.

Sir Herbert Griffin (representing the Council for the Preservation of Rural England), Sir Lancelot Graham (representing the Old Pauline Club) and Lady Graham, Sir Edward and Lady Maufe, Sir Howard Robertson, Sir Hubert and Lady Worthington and Miss Olivia Worthington, Mr. C. H. Aslin, Mr. T. E. Scott, Vice-President R.I.B.A., Mr. C. D. Spragg, Secretary, and Mr. W. R. F. Ellis, Deputy Secretary R.I.B.A., Mr. J. Brandon-Jones and Mr. H. J. W. Alexander (President and Secretary of the Architectural Association), Mr. E. Haynes (Secretary, Board of Architectural Education), Miss B. N. Solly (Architects' Benevolent Society), Mr. E. O'Shaughnessy and Mr. N. Musgrave (R.I.B.A. JOURNAL), Mr. I. E. Jones and Mr. N. M. B. Hannen (National Federation of Building Trades Employers), Mr. F. G. Baker, Mr. H. R. Bird, Mr. M. S. Briggs, Mr. Peter Cleveland, Mr. John Gloag, Mr. J. D. Hossack, Mr. A. W. Kenyon, Mr. A. B. Knapp-Fisher, Mr. and Mrs. A. Pott, Mr. S. C. Ramsey, Mrs. Leonard Reynolds, Mrs. Bronwen Simmons, Mr. Michael Tapper, Mrs. Edward Thomas, Mr. L. K. Watson, Mr. and Mrs. H. D. Ziman and members of the R.I.B.A. staff.

Lady MacAlister and Mr. Sydney Tatchell were unable to be present.

Ειναι ολα Ελληνικα

The above is the title of the theme for the next A.B.S. Ball—'It's All Greek'.

Tickets for the Ball, which will be held at Grosvenor House on 11 December 1957, cost 50*s.* each and application forms for tickets will be appearing later in the JOURNAL. Anyone, however, who wishes to be sure of securing a ticket—and many people were disappointed last year—can send in a reservation without delay to Mr. C. J. Epril, 55 Pall Mall, S.W.1. A cheque covering the cost for the number of tickets required should be sent with the application.

Council Matters

At the Council Meeting held on 18 June, Mr. Kenneth M. B. Cross was welcomed warmly on resuming the Chair after his absence abroad. The President gave a brief report to the Council on the visit made by himself and the Secretary to the overseas Allied Societies, Chapters and Branches in Singapore, Australia, New Zealand and Canada and also to Fiji, San Francisco, Washington and New York from 20 March to 5 June.

The Council unanimously recorded their appreciation of the President's and Secretary's services to the Royal Institute and to the profession as a whole in undertaking the tour.

The Council gave formal approval to the award made by the Jury of the West Yorkshire Society of Architects of the R.I.B.A. Architecture Bronze Medal in the area of the Society for the five-year period ending 31 December 1956, in favour of Farnley Hey, Farnley, near Huddersfield, designed by Mr. C. P. Womersley [*A*].

The next item on the agenda will give almost universal pleasure, although it is a long while ahead. On the recommendation of the Public Relations Committee, approval was given to the acceptance of an offer made by the Federation of Danish Architects for the R.I.B.A. to present an exhibition of Contemporary Danish Architecture in 1958.

Also on the recommendation of the Public Relations Committee, it was agreed that the premiated designs submitted for the Paisley Technical College Competition should be exhibited at the R.I.B.A. and they were on exhibition from 3 to 20 July.

Approval was given to a recommendation made by the R.I.B.A. representatives on the Junior Liaison Committee that a debate should be held at the R.I.B.A. on Wednesday 23 October. The motion to be debated is 'That the combination of professional and contracting services in the same organisation is not in the best interests of the building owner.' The debate will be held under the auspices of the Junior Liaison Committee of the R.I.B.A., R.I.C.S. and Institute of Builders, and will be open to students and junior members of the three bodies. In the case of the R.I.B.A., Fellows will not be eligible to attend.

The Civic Trust

In a statement issued to the Press on 5 July, Mr. Duncan Sandys, M.P., Minister of Defence, announced that substantial funds which had been subscribed by industry to encourage good architecture and civic planning are to be administered by a Trust to be known as The Civic Trust, an unofficial body initiated by Mr. Sandys in his private capacity, and of which he is President.

A.R.C.U.K. Appointment of Registrar

Mr. David Benton, B.A., LL.B., has been appointed Registrar by the Architects Registration Council of the United Kingdom in succession to the late Mr. Pembroke Wicks. He will take up his appointment on 1 August.

Mr. Benton is aged 49, and is married. He was educated at Cheltenham College, and Jesus College, Cambridge, where he graduated with Honours in Law. From 1930–40 he practised as a barrister. He volunteered for service in the army in 1940. After a period of service as an officer in the Royal Fusiliers, he volunteered for Special Operations. He later served as a staff officer in the Adjutant General's Branch.

On release from the forces in 1946, he took up an appointment in the Lands and Legal Branch, Ministry of Supply. He was appointed Negotiating Officer on the headquarters staff of the Royal Institute in August 1946 and an Assistant Secretary in 1950.

Appointment of Assistant Secretary, R.I.B.A.

The R.I.B.A. recently appointed a Secretary for Professional Relations to conduct research, with the help of any necessary staff, into a wide range of matters affecting the future of the profession. There is a strong economic or statistical content in several of these issues and the Royal Institute accordingly decided to appoint an Assistant Secretary with appropriate qualifications to work under the general guidance of the Secretary for Professional Relations.

Miss J. M. N. Milne, at present with the Board of Trade, was recently appointed to this post. Miss Milne was educated at Streatham Hill High School and Newnham College, Cambridge, where she took an M.A. in mathematics, economics and statistics. She is a Fellow of the Institute of Incorporated Statisticians, and from 1941 to 1948 worked on economic research and intelligence at the Ministry of Economic Warfare and at the Foreign Office. After some three years on general administrative duties with the South Western Electricity Board, she then joined in 1952 the Statistics Division of the Board of Trade, where she has since been concerned with the collection and interpretation of statistics about industrial production. During 1953–54 she was Joint Secretary of a Committee on Censuses of Production and Distribution, under the Chairmanship of Sir Reginald Verdon Smith.

Appointment of Assistant Secretary (Building Science and Technology)

An architect or other candidate with knowledge of Building Science and Technology is required for an appointment as Assistant Secretary on the headquarters staff of the R.I.B.A.

The duties will be primarily concerned with the secretariat of the Science Committee and other activities under the Committee's direction, but the successful candidate will also act as Technical Editor of the R.I.B.A. JOURNAL. The salary will be at a starting-point according to age and experience on a scale of £1,250 per annum rising by annual increments of £50 to a maximum of £2,000. Further particulars and application forms can be obtained from the Secretary, R.I.B.A., 66 Portland Place, London, W.1. Closing date 10 August.

The Captain's Prize

At the R.I.B.A. Golfing Society's Summer Meeting on 29 and 30 June over Princes Golf Course at Deal, the Captain's prize was won by Sir Giles Scott, O.M., R.A., Past President of the R.I.B.A. and President of R.I.B.A.G.S. This was both a most popular win and a remarkable performance, for he beat by two strokes his own age of 74 with a net 72 over one of the longest and most testing courses in the country, on one of the hottest days of the year.

The cup that goes with the Captain's prize was originally presented by Sir Giles to the A.A. Golfing Society, and subsequently when the Society was reformed as the R.I.B.A.G.S. This gives point to Sir Giles' remark on being presented with the cup that he was getting his own back even after 35 years.

The Conference Papers on
Finance, Design and Durability of Buildings

THOMAS MITCHELL, M.B.E., B.Sc., A.M.I.Struct.E. [*A*]

Outlining the Problem

Taxation

The taxation system in this country in many ways encourages cheap capital cost in new building and a deliberate acceptance of relatively high maintenance cost, particularly in the case of successful industrial and commercial concerns, because maintenance costs are an allowable charge against profits for taxation, whereas capital costs are not, except in the case of industrial buildings, which receive for taxation an initial allowance of 10 per cent and an annual allowance of 2 per cent of the initial expenditure, and agricultural buildings, which receive an allowance of 10 per cent annually for ten years. The result is that the cheapest possible initial cost is pursued relentlessly in spite of the fact that the cost of servicing the capital invested by industry in building is sometimes small compared with other charges—labour, material and equipment.

In buildings outside the commercial category the cheapest initial cost is equally sought after for reasons which also arise from the fiscal policies of successive governments.

Building for universities, technical colleges, schools, hospitals, the armed forces, and many other categories all have to be paid for largely by taxation. Nobody wants higher taxation, yet we need more and more of many of these types of buildings: and so there is a constant pressure to build more cheaply.

House rents are paid for with the income that is left after taxation, and in this field one might expect to find the search for cheapness at its keenest, although since the upkeep of houses has to be paid for out of the same pocket, it would not be surprising to find equal keenness to design in such a way as to keep down maintenance costs, some striving to strike a balance. We may well find that even in this field cheap capital cost takes precedence over any but certain very well established maintenance considerations.

Is this a sound overall policy?

The Building Force used for Maintenance

The building industry has a total labour force of 1,186,000. Of these, 327,000, equivalent to 27·5 per cent of the total, are devoted to maintenance.[1] Therefore there are 859,000 left for new construction.

[1] Ministry of Works figures for 1956. They include the estimated number of persons engaged on administrative, technical and clerical work, and exclude labour employed by public authorities. Corresponding figures for 1955 were: All work, 1,164,000; Repair and maintenance, 334,000.

The demand for new construction has been held in check artificially by the credit squeeze. Before it started to operate it was already obvious that demand was greater than the capacity of that portion of the industry free to undertake it.

If our country is to prosper, the demand must increase. We need more houses, more redevelopment of existing built-up areas, more hospitals, schools, technical institutes, university facilities, power stations, more re-equipment of existing industry and more building for the new industries on which our economic future may depend.

To keep industry competitive and to raise the standard of living as much and as rapidly as possible, building costs, like all other costs, must be made as low as possible.

There are many aspects to this.

The one that concerns the Conference is this. It cannot help to erect buildings in such a way as to use up in subsequent years a large building labour force to maintain them, and by so doing deprive ourselves of new construction. The new buildings so lost could contribute directly to raising the standard of living: but the maintenance work merely preserves the existing situation.

We have a duty to consider this problem seriously, to use our best endeavour to minimise this staggering annual maintenance bill. At the same time we have a duty to build as cheaply as possible, to be the leaders in the search for lower initial costs.

Factors contributing to Lower Costs

There are many factors which can contribute towards lower costs, and not all of them are within the architects' control. Some lie fairly and squarely on the shoulders of the builders: some are concerned with the work of quantity surveyors: and some should be the joint concern of all sections of the industry.

The report of the 1950 Working Party on Building in their conclusions and recommendations gave a very comprehensive list of points which are still valid and to which various Committees of the Institute have given careful study, which is continuing. In addition, the last two Institute Conferences have devoted themselves to some aspects of architectural and building economics.

No single Conference or paper, however, can deal with the whole problem. Nor is a single once-and-for-all study of any particular sub-division of the subject of lower costs of any value.

All factors which can contribute must be studied continuously: and by lower costs I do not mean producing cheaper buildings by the substitution of cheaper materials, but buildings of equivalent or better performance standard for less money.

No excuse is needed, therefore, for the resemblance which this year's Conference subject has to the last. It is not a superficial resemblance. Dr. Weston, in his paper at last year's Conference, made reference to the relation between capital and running costs. We are continuing from there.

At this point let us be clear that this is an Architects' Conference, and not a Conference of maintenance supervisors. We are concerned with *designing* for reasonable maintenance costs, with the effect of maintenance considerations on *design*, which of course includes planning, and not merely with the choice of, say, the hardest wearing floor finish for a particular job, although we have to do that as well.

Man lives not by bread alone. It is not enough that all the components of a building—the walls and roof, the finishes and the services—be chosen to give the life and usefulness required of them with a minimum acceptable maintenance factor: that would usually produce an arbitrary and often dull appearance, and would neglect one of the architect's skills, the conscious exploitation of colour, texture and form.

Further, architecture is not concerned merely with appearance. Ease of maintenance must be inherent in the planning and construction.

We must achieve buildings which will not need great expenditure in future years to operate them and to maintain their appearance and usefulness, display a conscious choice of visual elements and satisfy the functional and psychological requirements of use.

The Architects' Brief

The briefing of architects by their clients is a subject in itself, and contains many aspects which are outside the scope of this Conference. Some, however, are very relevant.

Should the brief give some indication of acceptable maintenance costs? From published figures local authorities know for housing where the money they spend on maintenance goes, and no doubt many do also for other types of buildings. Has this affected their briefing? Should it?

Clients are generally fairly clear about the accommodation they want, and are often very definite about wanting it as cheaply as possible. Their ideas about briefing very often stop there. Yet there are many other matters on which architects require instructions.

Some of these are settled for them by bye-laws and regulations made under various Acts. Others are contained in Codes of Practice and British Standards which are not mandatory, except in so far as they are incorporated in 'deemed to

satisfy' clauses in bye-laws; and as yet, with notable exceptions, they are not universally accepted.

All stages of design would be accelerated if all who commission buildings could agree on many matters on which individual architects customarily have to make individual *ad hoc* decisions which are only correlated within the limits of the existing quantity of exchange of information or standards set up in individual offices—and these latter are often at the mercy of the whims of clients.

This agreement should be in strictly functional terms, and should be incorporated in the architect's brief.

It may well be that in spite of the present lack of general acceptance of Codes of Practice, their growing prestige may make them an acceptable and useful means of ensuring more uniform assessment of the standards to which we design.

An immediate advantage would be that this would make the comparison of the costs of different buildings of the same type more valid, and would therefore assist in cost control in design.

The Cheapest Possible Building

Now let us examine three commonly used phrases:

(*a*) The cheapest possible building.

(*b*) The 'temporary' building.

(*c*) The 'limited life' building.

We have all heard phrase (*a*) from our clients many times: in their minds, very often, intelligent though they may be, the phrase means exactly what it says. They are prepared to accept the cheapest possible price for a building of the physical dimensions required. Generally they are equally prepared to grumble afterwards if it does not perform as expected.

The phrase has little meaning unless qualified by performance standards. Very often a relatively cheap building may require components which are the best and most expensive of their kind if it is to perform the job at all.

An example of this would be an unheated storage warehouse having a big turnover of heavy goods handled by fork-lift trucks. Here the cheapest roof covering might well also be the best, but the best and most expensive industrial floor available might be a necessity.

The cheapest possible house, school, office, hospital, in literal terms, would simply involve depriving ourselves of the conveniences, comforts and amenities of today. There are no such structures. What we do commonly is to decide, sometimes arbitrarily, which of these conveniences, comforts and amenities we can afford.

The Temporary Building

The 'temporary' building is an equally nebulous phrase. How temporary? And why 'temporary'?

Post-war prefabricated houses were considered temporary. How temporary were or are they in fact? Their siting in many cases was temporary for a variety of reasons, which at first sight are not the concern of this Conference, but which in fact do lie within its scope, for money was spent on these as well as on the houses, with a conscious acceptance of limited durability.

Why were the houses themselves considered temporary? The foundations, floors, internal partitions and finishings, the fireplaces and chimneys, the electrical and hot water systems, the sanitary fittings, plumbing and drains, the kitchen fittings and the various cupboards, the internal decorations and the external painting, the windows and their glass and the doors were all as durable as in any other houses of the time. Only the external walls—or wall systems—and roofs differed. Why were they considered temporary? The answer to this question brings us very close to one subject which is bound to be discussed very seriously by this Conference.

Was it because the materials were:

(*a*) New in their application to houses?

(*b*) New entirely in building, and hence untried?

(*c*) Known that they would not prove sufficiently robust against user damage?

(*d*) Considered that their external appearance would gradually deteriorate to the point where it would be unacceptable?

I must leave others to pursue this if they will. I shall not be surprised if they do, because I expect we shall find that this Conference will concern itself very much with problems arising from the use of new materials.

It will be appreciated that the word temporary has, for our purpose, by no means a simple meaning. As I am only outlining the problem you are to discuss, I have deliberately chosen an example which in this country is now past history, leaving to other speakers the exploration of the existing and different current problems of a similar nature which are today revealing themselves one by one—crop by crop, some would say.

It would be wise, however, to exploit fully the lessons to be learned from the immediate post-war programme of non-traditional houses. Here was a vast experiment carried out with public money, now old enough for valid conclusions to be drawn. They should not be missed.

We should, of course, acknowledge the difficulties of the period not only in the supply of labour and materials, but also the difficulty of foreseeing the pattern of economic recovery, and we should not at this Conference spend time defending or criticising the basic conception of the post-war programme of temporary bungalows, nor deny its achievement.

The Limited Life Building

The 'limited life' building conception might appear to differ little from the 'temporary' building, but that has not been the case so far as architects' thinking is concerned.

It is a phrase which became current between the 1914 and 1939 wars and it has had a good deal of influence, albeit unconscious, on the design of buildings.

During the 'thirties it was being said that whereas in this country we constructed our buildings to last for centuries and kept on adapting them to new uses, in the United States buildings were only reckoned to have a useful life of 30 or 40 years, and were then pulled down completely to make way for new buildings to suit new purposes.

However, most of the American construction which was, and is, pulled down after what, to us, seems a short life was built in no less permanent a manner than any similar buildings erected in this country during the same period.

The American buildings had been financed in such a way that the original capital had been redeemed, and once that was done, in a country with a buoyant economy, in some cases pulling down and rebuilding offered fresh and increased opportunity for profit, especially when land values had risen, or, where changing need occurred, it was simply cheaper than alteration.

This doesn't always happen, however. In 1945 The Western Saving Fund Society, owning and occupying in the heart of Philadelphia a building originally erected in 1898, considered rebuilding. Investigation of the original structure indicated that the foundations and the steel frame of early type fabricated columns and girders were in sufficiently good condition to remain, but that the floor construction of brick arches supported by secondary beams was not adequate to support the new floor loads required.

The Society, which is one of the principal banks in Philadelphia, finally acquired two adjacent properties of similar age, completely gutted the lowest five floors to the steel frame and rebuilt them for its own occupation, renovating the remaining floors for letting, at a cost of slightly over $2,400,000. This result was arrived at after extensive studies of various possibilities extending over three years. The Society, being bankers, were obviously in a position to apply the best financial advice to their problem.[2]

Without going into any financial calculations at all it would be agreed that a building, designed to last 40 years, if such a thing were possible, could not be built for half the cost of a similar building designed to last 80 years, and that in the second 40 years of the life of the 80-year building the renewal of parts incapable of being made to last 80 years—such as boilers—would be much less than the cost of a new 40-year-old building.

Further, as far as commercial building is concerned, renewals in the 80-year building, excluding any element of improvement, would be allowable for taxation relief whereas the replacement of the 40-year building would not so qualify. Agricultural and industrial buildings, as previously stated, attract special taxation treatment.

We could at this point dismiss the conception of the limited life building as a

[2] The architects were Messrs. Harbeson, Hough, Livingston and Larson. Messrs. Willing, Sims and Talbutt were associated architects.

piece of loose thinking, at the same time remarking that in many types of buildings flexibility to enable alteration for changing requirements is a much more practical aim economically.

The idea, however, seems to have had some influence on a very important national building programme—that of schools—and it may therefore be worth while considering this briefly.

The Board of Education publication *Suggestions for the Planning of new Buildings for Secondary Schools*, 1937, ch. IX, said: '... it is not economical to build schools of a more substantial character than is necessary to resist the weather and the hard wear to which they are subjected, or so solidly that they cannot be adapted to meet the possible changes in the requirements of Education'.

Farther on in the same publication occurs what would nowadays be considered a delightfully naïve paragraph:

'If Architects are in doubt as to the strength, durability, and weathering properties of certain patented materials, proprietary articles and processes, it is suggested that they might obtain useful information by applying to the Director of the Building Research Station at Garston.'

The Board must have felt that more prompting was needed, for in their 1938 publication *Elementary School Buildings*, architects, to encourage them to build less substantially, were reminded that . . . 'legislation was invoked to exempt new school buildings from the operation of the local Bye-laws . . .', were told that timber schools might be expected to last 40 years, or more, and that 'many difficulties in modern Educational administration are due to schools built to last a century and too solid for adaptation, without excessive cost, to the inevitably changing requirements of Education'.

Then, as though to counteract any idea that it was mere cheapness in initial cost which was sought, we find it stated that 'The Board would give sympathetic consideration to such results as seemed to offer savings in initial cost sufficient to counterbalance extra charges for upkeep'.

Taken together, this is a somewhat confused series of statements linking finance, design and durability.

The Board wanted buildings which would not last as long as older schools, yet it seemed reluctant to pay any less for them unless the savings would pay for any additional maintenance costs arising from lesser durability. It seemed to want to encourage architects to use novel materials and methods of construction, and had freed school buildings from local bye-laws for that purpose. And it wanted adaptability, which normally means higher initial cost.

This gave architects what, for the time, was a remarkable freedom in design. Post-war shortages of building labour and materials gave them a further incentive to explore new building systems so as to utilise tradesmen and material, not up till then normally employed on building, to prefabricate components which could be erected quickly with labour of a type which would augment the normal building industry labour force.

The Board's successor, the Ministry of Education, has exercised strict control over initial cost; but durability of very varying degree has been accepted.

The Ministry has got in some measure in different schools everything the Board aimed at, and more. It has also got multi-storey schools of brick cross wall and concrete floor construction, just as inflexible and difficult to alter as the too solidly built schools of which the Board complained in 1937 and 1938, but incorporating cladding materials of lesser durability.

Our post-war prefabricated schools have been praised, but in the end it will probably not be their financial soundness nor durability which will be remembered. Architects, freed from the discipline of proven methods and materials, have concentrated on keeping within the Ministry targets for initial cost and on the exciting design possibilities which the Ministry's brief for accommodation and teaching environment has given them. They have not had time for the research and development needed for a proper study of the durability of many of the methods and components used.

This Conference is an opportunity for stock-taking.

Durability

There is a Code of Practice on Durability.[3] The British Standards Institution say it is not a best seller. It is an admirably concise document, somewhat like a dehydrated vegetable.

The body of the Code is slight, starting by saying 'The durability of buildings and their associated installations should be adequate for the purposes for which they are designed', and ending 'There is at present insufficient experience available to assess the life under all possible conditions for all materials now in use . . .'.

As in many documents, the greater substance is in the appendices, which give an invaluable check list for the causes of deterioration of buildings and their installations, the susceptibility of building materials to deterioration, the classification of water supplies in relation to their effect upon metals, the classification of ground waters and soils in relation to their effect upon concrete, the classification of atmospheric pollution conditions, and some remarks about the effect of design upon the durability of materials.

I suppose it is ten years since the drafting of this Code began. It will be interesting to see whether the Conference will reveal sufficient advance in knowledge to justify a revision of Chapter IX. We need not be discouraged if it does not, for ten years is not long in history, particularly in relation to durability: on the other hand, we have had a lot of experience during these ten years which the authors of the Code did not have at their disposal.

On this point we are frittering away our chances of accumulating knowledge of real value by failure to establish a continuing and comprehensive national study of durability, with preservation of the original specifications of the subjects selected for study. Mr. Hope Bagenal made a plea for this in a scholarly paper on 'Exposure, Durability and Maintenance in Modern Design' given at the Architectural Association in January 1952.

A fact worth noting is that the model bye-laws hardly mention durability. This is probably because soon after the Great Fire of London timber was forbidden for the façades of town buildings, and the materials which took its place had inherent durability.

This is no longer the case, and the omission will probably have to be rectified. The L.C.C. has already found it necessary to introduce an amending clause to its bye-laws to deal with the fixing of cladding materials to ensure adequate durability for public safety.

Durability of Appearance

Something must be said about durability of appearance. You will hear a great deal more about it in detail later.

The appearance of traditional materials, such as good brick, stone and clay tiles, is retained or improved with age in all but the dirtiest of atmospheres. This is not universally the case with all the materials in current use. Quite apart from the financial aspect, it is important that materials should retain their appearance, that we may be saved a progression from pristine freshness through drabness to an appearance of decay and neglect.

In Stockholm, the coloured renderings of Vällingby and other new suburbs look fresh, but those on the older blocks of flats are often extremely dreary, and the buildings are only saved, in appearance, by their magnificent sites. The same can be seen in Zürich and elsewhere.

Materials need not always retain the same appearance as when new, to be acceptable. The change in the colour of copper to brown and green, and the weathering of Portland stone, are cases.

The changes, however, must be considered when designing: changes in colour due to ageing and weathering effects do not always improve the original design of a building, even when traditional materials are used: they can, indeed, alter the whole original balance of a composition. A study of the south façade of the Institute Headquarters at Portland Place is instructive in this respect.

A small amount of paint, applied in appropriate and legitimate places, as on doorways, can of course have an aesthetic value out of all proportion to its cost in offsetting surrounding materials of low colour value.

It must be noted, however, that at present for the ground floor level of buildings in cities, particularly for shops and the entrances to other buildings, no materials, no matter how expensive or durable they may be, will remain acceptable in appearance without very regular cleaning. The full implementation of the Clean Air Act should eventually cause big savings in this

[3] British Standard Code of Practice CP.3—Chapter IX (1950)—Durability.

respect, although it has perhaps not been appreciated widely enough that the sulphur content of the flue gases from oil firing is higher than from solid fuel.

The Life of a Building

What determines the life of a building? The answer is not entirely constructional, nor in many cases is it purely a matter of balancing capital and maintenance charges, nor even of obsolescence of purpose.

A perfectly sound building, entirely suitable for its purpose, may have its life ended because a rise in land values enables a more profitable building to be erected in its place.

Or, due to sociological or technological changes and due to its location, a building may cease to serve any useful purpose and be incapable of adaptation or be unwanted in any adapted form. Large isolated country mansions are a case. Obsolete atomic energy power stations may be similarly a problem for future generations. There is nothing which we, as architects, can be expected to do about this. The economics of electric power from atomic energy would not permit such power stations to be built so as to be adaptable for other purposes, and even if this were possible there would be no guarantee that anyone would want an obsolete but adaptable building of that type in the extreme North of Scotland.

On the other hand, in London and elsewhere the device of the full repairing lease has kept large numbers of Georgian and Victorian houses now used as offices in good structural and decorative repair. Their ability to attract such treatment is a function of their situation in the city or town.

The life of some buildings is shortened by sheer neglect.

There is little consistency of pattern.

The rate of interest at which money can be borrowed—which is influenced by Bank Rate—has a powerful influence on many types of new construction. During periods of dear money old buildings due for replacement are made to last longer. This often involves making major repairs which in themselves have the same expectation of life as they would have had if incorporated in new building—in other words, putting new wine into old bottles.

Again, according to newspaper reports of the views of the hotel trade, the erection of new hotels is inhibited by Purchase Tax on hotel furnishings and equipment, and obsolete hotels have their lives prolonged in consequence.

All these are matters over which architects have no control. If we could produce reasoned statistics it might well be that we could exercise some influence.

Let us, however, leave these extraneous influences and consider a new building, assuming that it is to be given the proper maintenance inherent in its design.

What should be the aim? We cannot design so that all its parts will last exactly the same length of time. Past experience is that structure has lasted longer than services and finishes, and that parts subject to user wear—such as stair treads—need renewal. Will that be the case with all buildings being erected today? Or will the hardwood block floors of some outlive their lightly constructed frames?

It would seem that with most buildings the essential structure should be the most durable part, and that the life of the building will in many cases be prolonged if it is such that internal rearrangement can take place. It would also seem that parts subject to user wear should be made as durable as the degree of wear and tear warrants. We know that this is not always so: that initial costs are kept down in many types of buildings by using materials and components not as robust as they should be for the wear they will experience, and which will therefore wear out and require renewal.

With all the new materials and methods which are being tried today, are we sure that we are according the best degree of durability to the various parts?

There is plenty of scope here for discussion.

The Building Owner's Responsibility

The old saying that a stitch in time saves nine applies very forcibly to buildings. It is accepted that machinery, from vacuum cleaners to motor cars, from pit winding gear to aircraft, requires regular servicing. Yet many assume that buildings need never be inspected, and can be left to look after themselves.

Much avoidable maintenance cost is incurred in this manner.

There is no reason why all the components of buildings should not be inspected and serviced to a schedule, as motor vehicles are. At present, when new buildings are handed over, some architects supply their clients with a certain amount of information about maintenance. There is no reason why this information should not be made as comprehensive and concise as the maintenance charts issued with cars and trucks.

To make this universally acceptable, and to avoid waste of labour in unnecessary inspection, would require considerable investigation and careful drafting of the instructions. For example, electrical installations should be tested regularly, but no one has yet been able to say in any regulation how often, because conditions for deterioration vary a great deal.

Again, education authorities have a big investment in floor coverings, and must spend a lot of money cleaning and maintaining them. They have similar conditions of usage, yet I expect it would be found that the amount spent per year per square yard of floor would vary a good deal.

The Institute might consider taking the initiative in this, and issue a *pro forma* for its members. Another possible approach would be the preparation of a Code of Practice. A combination of both might in the end prove necessary. Such documents would not, of course, attempt to duplicate manufacturers' maintenance instructions for specialised plant and equipment. Part of the task of any Committee dealing with this subject, however, would be to try to ensure that all manufacturers of such plant and equipment, or assembly sub-contractors, did in fact supply instructions, and in a standardised form.

The issue of adequate instructions about inspection and maintenance is not the end of the story. It is important that building owners take adequate steps to see that they are carried out. This is a function of management.

If anyone has any doubt about this last statement let me quote the case of a comparatively small factory housing very expensive plant and employing several thousand workers where roof repairs, which will cost approximately £60,000, are now urgently required to prevent collapse and to keep out the weather. In addition, production is bound to be affected while the repairs are in progress, and, as the plant manufactures components on which other factories depend, there will be further repercussions.

All this for want of a stitch in time.

Building by Stages

Authorities and building owners frequently decide to build a scheme in stages in order to spread the capital expenditure over a longer period. In many cases this is not uneconomical.

There are many others, however, which involve wasteful expenditure on temporary expedients; difficult decisions about boiler ratings and other services, which may result in the final plant being a compromise; temporary walling which may never be taken down and replaced; loss of the keener Bill rates which the larger job might attract, and, in factories, wasteful rearrangement of plant.

Finance, design and durability are all involved.

Calculated Economic Life of Components

W. J. Reiners[4] has said that in houses the structures are built to last for ever but contain fittings and finishes with a short life, and has asked if we build too soundly.

The essential structure of a building must, however, be built soundly in the sense that there must be no question of collapse as long as it can be occupied.

Where no danger to the occupants or the public is incurred Mr. Reiners' thesis can be explored. He gives a formula to determine the economic life of short-lived materials compared with traditional materials of theoretically unlimited life:—

$$L = \frac{\log \dfrac{C_1}{(C_1 - C_2)}}{\log (1 + R)}$$

where L = economic life of the short-lived material;

C_1 = initial cost of traditional material of unlimited life;

C_2 = initial and replacement cost of the new material (assumed less than C_1);

R = rate of interest.

According to this formula, if the rate of

[4] W. J. Reiners. 'Maintenance Costs and Economic Design,' THE CHARTERED SURVEYOR, September 1955.

interest is taken as 5 per cent, if a new material showed a saving of 10 per cent in initial cost its economic life would be 47 years, for 25 per cent saving 28½ years, and for 50 per cent saving 14 years.

It may be premature to ask manufacturers to add this information to their data sheets, but we are so accustomed nowadays to considering insulation values, fire resistance, and so on when designing that there need be no difficulty in using tables showing the economic life of materials, provided the formula is valid.

We have seen, however, that there are many other factors to be considered as well.

Mechanisation of Maintenance

W. J. Reiners has also said 'maintenance has a high labour content, and is not susceptible to the general advance in productivity associated with increasing mechanization'. That is true of jobbing maintenance—the replacement of ball valves, rewashering of taps, the replacement of odd tiles, slates, panes of glass, and the like. It is not true of the repair and resurfacing of modern highways, nor even of the periodic re-tarring of the older type roads. The Germans in particular have developed some remarkably mechanised methods of highway repair.

In buildings, even with current design, major repair and replacement can sometimes be carried out with at least the same degree of mechanisation as the original job, although removal of the perished material or components may often be much more labour consuming.

We must, therefore, try to eliminate what I have called jobbing maintenance and to design so that replacement can be carried out as easily as possible, with maximum mechanisation and with the minimum amount of site labour.

The pattern of labour in the building industry will probably force the pace of this process. The pay, status, and working conditions of building labour are likely to continue to improve. This will make the labour content of maintenance work more costly, and will reduce the difference in winter working conditions between new building and work on existing buildings.

The latter is sometimes said to be one inducement for older men to turn to maintenance work during the winter months, another being that it gives them a greater opportunity to exercise craft skill.

Even under present conditions, however, it would seem that what most men of all ages want is a high pay packet from overtime or bonus or piecework rates, and the pressure for this is often greatest before Christmas. On this score alone some builders report difficulty in attracting suitable men for jobbing maintenance work.

Further, it will become increasingly difficult to get the type of craft skill needed for this sort of work. Training in the building industry must be primarily for new construction, and that means training for increasing mechanisation and diminution of the labour content in erection. In all trades a new type of operative will tend to emerge.

It is desirable for flexibility that building labour should be interchangeable between new work and maintenance, and that the industry should not have to train a special force for the latter, and it therefore seems inevitable that maintenance should be adapted to the type of labour available, and not vice versa.

This process will be gradual, and therefore the risk of ordinary existing traditional buildings falling into disrepair for lack of suitable labour is probably not great. The difference between the cost of such maintenance work and of corresponding new work, however, is likely to increase greatly.

All this must cause concern about the future of the large number of historic buildings in this country. The ability to keep in being the craft skill necessary for their preservation will depend on providing building labour and management with financial opportunities at least as good as they could obtain in any other branch of the building industry.

Taxation is already making the preservation of historical buildings in private ownership increasingly impossible. That trend is bound to accelerate.

The State has a great responsibility here in selecting what it can afford to, and cares to, preserve.

In contrast to the argument I have just given, at present and in the foreseeable future for small buildings in country districts the incorporation of components made by specialist firms often causes abnormal expense in maintenance which local labour is unable to undertake. In these cases items which need visits by 'the man from London' should be avoided.

Unit Replacement

There is some scope in buildings for the technique of replacing complete units rather than individual components, just in the same way that with motor cars the major overhaul of engines in local garages has given way to the fitting of factory reconditioned engines. The packaged boiler unit for buildings is a step in this direction.

Accessibility for Maintenance

This leads to the consideration of accessibility for maintenance. Internal accessibility, particularly in relation to services, is well enough understood, but not always practised. Much more thought is needed to give us buildings which are not festooned with pipes and wires, but in which these pipes and wires can be renewed when necessary without tearing down parts of the fabric or finishings.

Few of us can say we have found an answer for every occasion.

External accessibility does not always receive the thought it deserves, perhaps because it can raise such awkward problems. Very notable attention has been paid to it in some important buildings in recent years: generally, however, I suppose few architects could say that they subjected every building on their drawing boards to a scrutiny on this score, and made sure that every part which might require attention could be reached by means commensurate with the cost of repair or replacement of the part affected. Probably a great majority of buildings have lurking somewhere on the outside a potential £5 maintenance job which requires £50 worth of scaffolding or tackle to reach it, or a piece of painting whose renewal cost is out of all proportion to its aesthetic contribution.

We must try to get rid of these. The discipline to design which this involves will often be irksome. We shall find ourselves faced not only with decisions involving the weighing up of capital cost, and ingenuity in construction, but also with important appearance problems.

Some are very familiar. In roofs, for example, which Mr. Womersley will deal with more fully, whereas on low buildings pitched tiled roofs and eaves gutters present no access problems for maintenance, in tall buildings eaves gutters become impossible.

Conclusion

I started by saying that nowadays all clients of all kinds want the cheapest buildings they can get and that it is our duty to provide them, subject to various considerations which I have outlined. I have tried to show that it is not easy to define what is meant by the cheapest initial cost. I have also said that the taxation system in this country in many ways encourages cheap capital cost in new buildings and a deliberate acceptance of high maintenance cost.

In outlining the problem I have tried to put all the generalisation in my paper and to create a backcloth against which your discussion may be staged.

The other speakers are not setting out to cover all the points I have raised, nor to deal with every component of building. We have all agreed that it is better for them to deal with a few matters fairly thoroughly rather than to skim lightly over the whole range of the subject.

It is not intended, however, to channel discussion, nor to inhibit it in any way. We want to know what problems exist in this field, and how members are meeting them. It is hoped that out of the discussion will emerge a clear pattern of the problems, relating to the subject of the Conference, which are worrying architects most, and that members will indicate, with priorities, matters which they consider require further study.

J. L. WOMERSLEY, M.T.P.I. [*F*]

Structures

'The real building economy is how much of the good things, at how cheap a cost, we can give. . . . But if you leave out the quality of the product, the whole economy is nonsensical . . .'

(Alvar Aalto, R.I.B.A. Discourse, 10 April 1957.)

The Problem

In considering 'Structures' against the background of the theme 'Finance, Design and Durability' at a conference of architects it is assumed that the fundamental problem under review is that of selecting materials

and determining techniques which will ensure that the completed building will provide adequate protection from the weather and suitable conditions for the activities pursued, at the lowest possible capital and maintenance cost compatible with the building's life, environment and status.

The realms of the particular aspect of building finance which relate returns of income, by way of rentals or output, to capital and maintenance expenditure are clearly outside the scope of a general paper such as this. Each case of that nature has to be judged on its own merits and the returns required inevitably have a direct bearing on the quality of the building which can be erected. In this more general consideration of finance in building, reference must be limited to the effect of restrictions of capital expenditure on the choice of materials and techniques and to the possibility of incurring increased maintenance costs by using cheaper materials and forms of construction. In short, the problem here is to decide upon a proper balance between capital and maintenance costs of structures in terms of money and manpower.

The Relationship of Capital and Maintenance Costs

In seeking to throw light on this problem one is very soon faced with the fact that although there is plenty of information available in regard to the capital costs of buildings and their components, there is a singular dearth of scientifically collated data in regard to maintenance costs. Whilst a number of property-owning bodies are able to point to particular items of excessive or recurrent expenditure on maintenance, few have apparently found it desirable to analyse maintenance items as a whole in such a manner as to form a reliable guide to the design of future buildings. Local authority housing seems to be an exception, however, as the Institute of Municipal Treasurers and Accountants periodically publish detailed information on maintenance costs in relation thereto. From this and from other information collected from local authorities direct by the Building Research Station, Mr. W. J. Reiners, on behalf of the Station, has written a valuable paper on 'Maintenance Costs and Economic Design'.

Two tables in Mr. Reiners' paper are of particular significance. The first equates maintenance cost in terms of capital cost and the second relates these capital costs to the component items of house maintenance. The tables are reproduced below.

It will be seen that Table II brings out the important fact that, so far as housing is concerned, maintenance of the structure is the lowest of all the capitalised maintenance items in terms of a percentage of its own initial cost, being only 5 per cent as compared with 33 per cent for heating, cooking and lighting and 100 per cent for external painting.

Whilst the absence of corresponding figures for different types of buildings is unfortunate—it should be quite possible to compile figures for schools, for example—the significance of the housing figures for other buildings having a similar type of structure should not be overlooked. It is clear that the maintenance expenditure now being incurred by local authorities and referred to in Table II is largely attributable to houses built in the pre-war period—houses which are predominantly of traditional construction. Thus the small maintenance figure for 'main structure' speaks well for the durability of the traditionally built house. The effect of the widespread use, since the war, of non-traditional and substitute materials upon this hitherto favourable cost item is not yet known, but it seems likely that the figure will increase and it is possible that the increase may be substantial.

It inevitably takes time for the lasting qualities of new external structural materials and techniques to be assessed and compared with those of tradition. Whilst many building components, such as mechanical services and internal finishes, may be adequately tested in the laboratory prior to general release to the industry, the fact must be faced that no laboratory test has yet been, nor is likely to be, devised to take the place of actual exposure to the elements with all their vicissitudes and variations in hill and dale, wind and gale, rain, snow, frost and in seaside and industrial atmospheres. There is no adequate substitute for practical experience and it is for this reason that it is of the utmost importance for the profession to collect and draw upon its combined experiences of new materials and methods of structure as they occur.

It is felt, therefore, that this particular paper may be of most use if it deals primarily with certain of the newer materials and techniques, in so far as experience has been able to assess them, against the background of traditional building. In order to do this, not only has reference been made to recent scientific publications but a number of the larger county and county boroughs have been approached, through their architect, to list those items which appear to them to be causing the greatest cost and greatest recurrence of maintenance in housing, schools and other public buildings. The observations received will be referred to from time to time under the headings which follow.

TABLE I

Equivalent Capital Cost of £1 Maintenance Cost per annum

Duration of life	Rate of interest		
	4½ per cent	5 per cent	6 per cent
	£	£	£
20 years	13·0	12·5	11·5
40 years	18·4	17·2	15·0
60 years	20·6	18·9	16·2
999 years	22·2	20·0	16·7

TABLE II

Components of Maintenance and Initial Cost in Local Authority Housing

	Maintenance cost		Initial cost	Total cost	Maintenance as percentage of initial cost
	Annual	Capitalised*			
	£	£	£	£	
Water service	1·90	42	50	92	84
Sanitary fittings	0·50	11	50	61	22
Heating, cooking, lighting ..	1·50	33	100	133	33
Internal structure and finishes ..	1·50	33	500	533	7
Main structure	1·15	26	500	526	5
External services and site works	0·90	20	100	120	20
External painting..	3·55	80	80	160	100
	£11·00	£245	£1,380	£1,625	

* Conversion factor 22·2—see Table I.

Walls

A. *Brickwork.* Since the establishment of the brick as the basic building unit for the greater part of Britain there has surely never been a more determined and sustained effort to find suitable alternative walling materials than the present one.

At the end of the war the dice seemed to be well and truly loaded against the brick. Brickyards were either partly or wholly out of production; there were few bricklayers; the machine age demanded large crane-handled units instead of small man-handled ones; various European countries were using light-weight concrete and hollow blocks; bricks, it was said, were too thick and too heavy. In current parlance, it seemed that bricks had 'had it'!

Now, twelve years later, we are still trying to find a material which (*a*) looks as good, (*b*) has the same performance in protection from the elements, (*c*) is anything like the same price, and (*d*) requires

as little maintenance as the good quality facing brick. To admit that this is so is not so much to decry all the alternatives which have been put forward, which have ranged from the bad to the good, but merely to emphasise the truly sterling qualities of the good brick, qualities which architects should not spurn merely to gratify a desire to do something different. As in all things connected with architecture, there should be sound reasons for using the material which is selected. There will be many occasions—such as in very large or multi-storey buildings where lightness of weight may have advantages—when an alternative cladding material to the brick will be appropriate; equally there will be many other occasions—and two- and three-storey housing may well be an important one—when it will not.

Little needs to be said about maintenance problems with brickwork of good quality, except to stress the need for adequate protection at the top and bottom of walls. Brickwork below ground level and up to the damp-proof course should be specially selected in relation to the character of the soil encountered or disintegration may take place. Clearly a little extra initial cost to secure a stronger brick in this position is money well spent. Too often over-all reductions called for to bring building costs down to a ceiling price are such that they can only be achieved by reducing the specification at such a vital point in the design and it is here where the responsible architect should call a halt. To use inadequately strong bricks below ground or to use an inferior damp-proof course is waste, not saving. The life of a damp-proof course should be at least that of the wall it is protecting, because to replace it is a major operation.

The other danger-point is in parapets which, from the point of view of both initial cost and maintenance cost, are better avoided. Theoretically it is possible to design parapets which will give no trouble, but in practice, due to faulty detailing or execution, it seldom seems to happen. Give walls of sound clay bricks in cement-lime mortar good protection by well-designed eaves and verges and you can forget all about them.

B. *Reinforced Concrete*. Unlike the present-day position in regard to many of the light-weight wall cladding materials, the length of experience of the durability of reinforced concrete has now been sufficient for a reliable assessment of this type of structure to be made. Special Report No. 25 of the National Building Studies covers this ground very adequately and the report itself is a significant result of successful collaboration between the Building Research Station and the Cement and Concrete Association.

The report confirms that with careful design and conscientious supervision reinforced concrete buildings have lasted upwards of 50 years without requiring any special maintenance. It goes on to say, however, that these prerequisites for durability are by no means invariably fulfilled, as is shown by the number of buildings whose walls have required partial or complete re-surfacing in a much shorter period. The vulnerable element is the steel, and if the concrete cover is inadequate to protect it from attack by water, trouble will follow as surely as night follows day. An example is quoted whereby, out of a total of 254 buildings examined for deterioration of reinforced concrete, it was revealed that in no less than 227 cases the damage was due to insufficient concrete cover, porous concrete, or both.

Special precautions are required in sea-side atmospheres and in any environment where the building is liable to chemical attack. Gas-works create particularly vicious conditions so far as concrete is concerned, brickwork standing up to the attack much better. In fact, brickwork is not infrequently used as permanent shuttering to reinforced concrete framework under these severe conditions.

Evidence also confirms the fact that reinforced concrete subject to damp air and soot deposit in industrial atmospheres is more heavily attacked when under cover—'protected' by canopies, for example—than when it is washed by rain. Special precautions are therefore required in such conditions. Parapets, on the other hand, are subject to severe exposure, being liable to both thermal and moisture movements which cause cracking and early deterioration. It is therefore recommended that they should be divided into moderate lengths by vertical movement joints.

The report makes it clear, however, that immunity from early decay can and should be achieved if the knowledge which is now available is efficiently applied and the following precautions are observed:—

1. Concrete cover should be at least 1½ in. over any bar, however small or secondary in importance. Most corrosion failures of beams and columns start with rusting of stirrups, hooping or even binding wire. Rusting of small bars soon opens up a path for moisture to attack main bars.

2. Reinforcement should be so designed that as much as possible can be assembled in units, to jig, and preferably welded together so that individual bars cannot be displaced during concreting and so leave voids in the concrete.

3. The practice of clipping tying wires off flush with the finished concrete surface should be forbidden.

4. External flat surfaces should never be horizontal unless protected by asphalt or metal flashings. Copings, string courses, sills, etc., should be given a generous slope above and be properly throated below. For parapet copings and window sills the use of precast concrete units, laid on a damp-proof course, may be advantageous.

5. It is essential that the cover actually provided should be a dense, practically waterproof concrete, as dry as it can be worked. Vibrated concrete is satisfactory with a water content 20 per cent lower than when hand rammed. The fundamental requirement is to eliminate voids or pores and to create the greatest possible density.

6. To obtain adequate supervision of important concrete work the services of a separate inspectorate are required as the clerks of works and builders' foreman have too many other duties to give the close and continuous attention which is essential.

It is clear therefore that, except in the most exceptional circumstances, failure or early deterioration can only be attributed to sheer negligence and that in general architects, engineers and contractors have no longer any adequate excuse for the spalling face of a modern reinforced concrete building. This is, perhaps, the classic case of the futility of cheeseparing on initial cost, for the cost of increasing the cover of externally exposed concrete by an inch at the time of construction would be negligible compared with the cost of applying new materials in repairs at a later date, with all the scaffolding, plant and organisation which would then be required.

A form of concrete walling which can perhaps best claim to rival brickwork in initial cost and performance is the 'no-fines' concrete wall which has played a large and important part in the housing field both here and on the Continent in the post-war years. Where it seems to compare less favourably with brickwork is on the combined grounds of appearance and maintenance cost, inasmuch as it is generally regarded as requiring a finish. It is then subject either to the considerable additional cost of brick or tile facing or to the initial and recurrent maintenance costs of renderings.

It is, however, inadequate to discuss reinforced concrete merely as a walling material, because its most interesting characteristic is that it can be used to form almost any or all of the components of structure—walls, floors, roofs or frames. Multi-storey flat building has led to intriguing developments of reinforced concrete structure in the form of the cross wall, the interrupted cross wall, the spine wall, the box frame, and the column and beam frame, all of which have their special application to the economy of particular building shapes. It is on this question of the economic design of buildings such as these that a greater degree of architect-engineer collaboration is required. The fact that effective teamwork at the outset of a design problem is at present the exception rather than the rule seems to be the fault of both professions. Too many architects seem to regard the structural engineer merely as a glorified mathematician who will work out the sizes of columns and beams after the important structural decisions have been settled. Too many engineers, it must be said also, seem quite content to accept this position and appear surprised if any different method is suggested. Such an approach is anything but scientific and if the results turn out to be economical it can only be by accident rather than design.

In the case of a recent project of multi-storey dwellings, where the object was to

provide a diversity of dwelling types and sizes within an economic and rigidly repetitive structural grid, many alternatives were put by the architects to the engineers for criticism in regard to cost and method of construction before a solution satisfactory from all points of view was achieved. That the time and labour involved in this interesting process was well worth while was shown by the low and keen tenders later received for the work. This, surely, must be the desirable sort of approach in future architect-engineer collaboration, an approach which will bring greater interest, more adventurous design, more elegant buildings and greater economy.

All too often in this country the degree of thermal expansion likely to occur in reinforced concrete frames or roofs is minimised in an atmosphere of optimism at the design stage and expansion joints are either omitted or reduced too drastically in number. Admittedly, the incorporation of these precautionary elements in the design is a complication, but no architect or engineer who has observed the disastrous effects of thermal movement on brickwork, partitions, plaster and decorations should take any risk in such a fundamental design matter. A properly thought out and well-detailed structural break in a building is a much better-looking feature than unexpected cracks and far less expensive in the long run. Roofs are particularly vulnerable to expansion and one of the most common cases of cracking occurs at the point where a long roof is built into a wall without provision being made for the movement which will assuredly occur.

In-situ concrete, including 'no-fines', is used in multi-storey buildings on the Continent with much less reinforcement than we are accustomed to use here. Thus in 16-storey flats at Sondermarken, Copenhagen, only the first three storeys are reinforced, and in the ten- and twelve-storey tower blocks at Bellahoj reinforcement was placed in the angles only. In Kleinpolder West, Rotterdam, the cross-walls of ten-storey slab blocks have reinforcement only in the first two storeys. These examples tend to confirm a feeling that the British Codes of Practice in structural design are unduly conservative and are responsible for a certain amount of waste of steel and money as well as causing many buildings and parts of buildings to look unnecessarily clumsy.

Despite certain potential disadvantages in regard to dirt attraction in industrial atmospheres, extensive research and experiment both in this country and abroad has established what is likely to be a permanent place for the well-chosen precast concrete block or panel in post-war building.

Here again it is of fundamental importance to use high-grade concrete and to give adequate cover to the steel. Sound specifications must be insisted upon and all temptation to reduce initial cost by reducing either quality or cover must be firmly resisted as there is plenty of experience of poor quality units spalling and having to be replaced.

Precast concrete units should be made either for easy one- or two-man handling or for crane-handling. The development by certain firms in this country and abroad of the crane-handled storey-height insulated concrete wall panel has undoubtedly made a contribution to the building economics of large-scale multi-storey buildings. With close co-operation between architect, engineer, manufacturer and builder a great deal can be done by simplification of design and the fullest use of mechanical plant to reduce the cost of multi-storey work. In the case of a certain scheme of 13-storey flats in Copenhagen it was claimed that the cost per square foot came within the ceiling price allowed for three-storey load-bearing dwellings. The degree of teamwork existing between designers, manufacturers and builders from the earliest stages of some of the building projects in that city is clearly achieving remarkable advances in concrete techniques and in building economy. There is scope for much more effort in this respect over here.

C. *Lightweight Claddings*. Even the traditionalist today has to admit that economic circumstances preclude him from using load-bearing walls for the majority of buildings over four storeys high. Thus if he wishes to reproduce the 'holes in the wall' type of fenestration he has to do so by clothing his steel or concrete frame with large areas of stone or brick which, though much thinner than if they were load-bearing, are nevertheless quite heavy. The steel frame has to support them and the foundations have to carry the lot. Thus, however low in maintenance it may be, the achievement of durability by solidity would not seem, initially, to be either cheap or speedy.

Yet despite many of the apparently logical attractions to the use of light-weight claddings in framed buildings—lightness of weight, speed of erection, saving of space—the architect who earns his bread and butter principally by designing houses, flats and schools frequently finds upon analysis that these apparent advantages fade away before his very eyes. It may be worth while, therefore, to examine why this so often happens:—

Firstly, the claim that space gained by the thinness of the material brings in considerable additional rental, is usually supported by data related to multi-storey office buildings in America where a few square feet of extra floor space per storey bring in remarkably high returns in rental. Such returns become greatly reduced when applied to buildings of a mere four to twelve storeys in London, and elsewhere in Britain those seeking office accommodation seem to want it on extremely low terms. When applied to mere domestic and educational buildings the gain in space becomes insignificant in relation to the cost of the walling.

Secondly, the space-gain is not so much as may have been anticipated at first sight. Bye-laws for external walls require a fire resistance of one hour for an infilling between a structural frame and two hours for a curtain wall, which means that in most cases the light-weight cladding has to be backed by 4 in. of solid (usually traditional) material up to normal window-sill height. Thus floor space gain, which might have been as much as 9 in. (11 in. – 2 in.), is reduced to perhaps 4 in. (11 in. – 7 in.) because a cavity between the two materials will normally be required.

Thirdly, comes the disillusionment about cost. It is safe to say that all metal frames used either to infilling panels or curtain walls and all proprietary infilling materials can be excluded if there is a need to compete economically with the normal traditional cavity wall and windows. Of the light-weight claddings, therefore, one is left with little but timber frames with either timber or glass infilling panels and the combustion or breakage problem involved with one or the other.

The only credit items which remain are those of speed of erection and lightness of weight and the fact may as well be faced that, so far as price is concerned, there will be few sound arguments in favour of using proprietary light-weight claddings until either the manufacturers bring down the cost of their materials or the bye-laws and fire regulations are altered.

Tables III and IV which follow give some recent prices received for various types of cladding and show that brick infilling is about half the cost of many of the other materials.

Nevertheless, despite the present cost disparity, there is little doubt that the manufacture and use of dry factory-made panels will continue, for there are many circumstances under which a saving in purchase-cost of materials will be more than offset by the advantages of constructional speed and suitability for a particular purpose.

All architects will be familiar with the comprehensive and expert dissertations on this subject given in recent years by W. A. Allen and Edward D. Mills, but at the risk of a certain amount of repetition it is felt to be desirable to include some comment in this paper. The observations which follow are based firstly on the two recently issued Digests of the Building Research Station and secondly on the particular experiences of a small number of private architects who have used lightweight infilling panels and curtain walling on a large scale.

The basic problems, apart from structural stability, appear to be those of weather resistance, thermal and moisture movement, heat and sound insulation, condensation and fire resistance.

(i) *Weather Resistance*. The difficulties in regard to weather resistance are chiefly those which arise from the imperviousness of the claddings in contrast to the absorptive qualities of traditional materials. Thus, not only has a considerable run-off of rain-water to be provided for at the base of the building but the joints are called upon to withstand abnormal weathering action. Risk of water penetration is increased by strong winds and in exposed positions the

TABLE III

Job	Brief specification	Price per yard super of cladding (as at April 1957)
1. Comprehensive School, London 4 storeys	Panels between structural frame formed with precast concrete posts and steel angle ties; hardwood windows with metal opening lights; 32 oz. glass; below sill 4½ in. brick wall in facings and 3 in. clay blocks plastered and painted internally.	£ s. d. 4 19 0
2. Technical College, Yorkshire 4-storey block	Panels between structural frame formed with precast concrete posts and hardwood framing; hardwood double hung sashes; 32 oz. glass; below sill clear glass backed with 3 in. concrete block colour-rendered on one side and plastered and painted internally.	6 4 0
3. Technical College, S. Wales. 4-storey block	Panels between structural frame with precast concrete posts and steel angle ties; hardwood windows with hardwood opening lights; 32 oz. glass; below sill precast concrete slabs and 3 in. clay blocks plastered and painted internally.	7 1 0
4. Technical College, Yorkshire 10-storey block	Aluminium curtain walling, half 32 oz., half ¼ in. polished plate; below sill wired glass backed with 3 in. concrete blocks colour-rendered one side and plaster on 'Newtonite' and paint the other.	10 18 4
5. Airport	Steel mullions and top and bottom rails, infilling timber frame with fixed glazing and opening lights in metal.	11 15 0

Per Messrs. Yorke, Rosenberg & Mardall.

TABLE IV

Job	Brief specification	Price per yard super
1. Office Block, London	9,030 ft. super of walling, comprising aluminium framing, steel sashes and 'Vitroslab' infilling.	£ s. d. 9 4 6
2. Office Block, London	10,140 ft. super of walling, comprising steel framing and sashes and 'Vitrolite' infilling.	11 5 0
3. Seamen's Home	25,565 ft. super of walling, comprising steel framing and sashes with 15 per cent insulated 'Decoplast' infilling and 85 per cent 'Vitroslab' infilling.	10 16 0
4. Laboratory	8,950 ft. super of walling, comprising aluminium framing and sashes and insulated 'Holoplast' infilling.	11 14 0

NOTE:—Job No. 1 is a standard manufacturer's framing with only minor modifications. The remaining jobs are purpose-made.

Per Messrs. Gollins, Melvin, Ward and Partners.

traditional forms of drips, weepholes and ventilating channels may admit water which is driven up the wall face as well as down. In a survey taken in America no less than one-fifth of 160 owners of buildings with curtain walling reported air or dust penetration at junctions of window frames with surrounding claddings.

The Research Station reaches the conclusion that, as the ideal requirements of permanence and stability for exposed mastics appear to be beyond present practical achievement, sealed joints give less permanent satisfaction than adequate drainage behind the outer face of the wall—as in patent glazing. In very severe exposures, however, such cavity drainage systems may need channels with steps 2 in. high to avoid risk of penetration by wind-driven rain.

(ii) *Thermal and Moisture Movement*. Thermal movement may be particularly troublesome with large panels fitted into rebates in rectangular frames, as if the panels and frames are of different materials differential movement will occur which may cause the failure of any putty or mastic. It is surprising to learn that even in Britain—dependent on the colour of the panels, method of insulation and weather conditions—temperature range may be as high as 160° F. Thermal movement is particularly high in the case of aluminium (twice that of steel) and across the grain of timber. Where aluminium is used for curtain walling over many storeys it will be more greatly affected by thermal movement than the structure itself, for which reason fixing must be by means of slotted bolt holes in which particular care is required in design to allow ease of movement.

Movements caused by temperature and moisture changes in porous materials such as wood and cement products often tend to counteract each other, though it is still important to allow for expansion. With non-porous materials, however, there is no drying contraction to counteract thermal movement so that full allowance for expansion in long runs of butt-jointed materials is essential if costly failures are to be avoided.

Exposed concrete frames are less subject to thermal movement than are metal frames because of their general lightness in colour and greater thermal capacity.

(iii) *Heat and Sound Insulation*. To obtain effective insulation from heat it is recommended that the external waterproof skin should be separate from the inner insulating layer, a ventilated air space between the two acting both to reduce the temperature of the outer skin in sunny weather and to exclude water penetration and condensation.

With regard to sound insulation, it is an unfortunate fact that lightness in weight and high resistance to airborne sound do not go together, which is again a serious disadvantage from the cost point of view. Where there is likely to be noise from external sources, therefore, large areas of light cladding or single glazing may have to be avoided. Airborne sound between adjacent rooms and between adjacent storeys may also be serious unless air-tight seals are provided at the junction of cladding and structure. Even minute gaps between the edges of partitions and cladding may seriously reduce the effectiveness of the insulation qualities of the partitions.

(iv) *Condensation*. Persistent condensation will ultimately damage stove-enamel or brush-paint on glass or metal external panels or on any permeable insulation behind them. In normally heated buildings condensation will best be avoided by providing a drained ventilated cavity behind the outer skin, the outlets for water serving also to allow vapour in the cavity to be expelled to the open air. Deterioration to paints and enamels is least likely when the outer skin consists of two impervious sheet materials separated by a sealed air-space. Experience shows that reasonable durability of the edge-seal can be ensured and the coloured material is therefore kept dry.

(v) *Resistance to Fire.* It has already been stated that bye-laws require a fire resistance of one hour for infilling panels within structural frames and two hours for curtain walling. Where curtain walls have a metal frame it is unlikely that the latter will meet these requirements so that even though the infilling material itself may have adequate fire resistance the 'curtain' will need to be backed up with solid material either to sill height or in the form of horizontal ledges or balconies.

(vi) *Maintenance and Weathering.* Whilst it is not yet possible to give a reliable assessment of the durability of many of the new cladding materials, the supreme importance of distinguishing between materials carrying the same basic name—such as between the various alloys of steel and aluminium and the various types of plastics—has already become apparent. Apart from this fundamental factor other difficulties found in practice include the spalling of thin precast concrete slabs due either to insufficient thickness or density of the concrete cover and the cracking of wired glass due to under-estimation of thermal movement. A constructional difficulty, inherent in the application of precision factory-made components to a building structure, is that of tolerances. Clearly, a more scientific attitude towards methods of setting out, the preparation of jigs and templates and towards the execution of the structural work is called for than in the case of a traditional building of load-bearing construction.

TABLE V

(A) Pitched roofs, 21 ft. span	Cost as a percentage above basic
(*a*) Basic construction T.D.A. roof trusses to 35° pitch at 6 ft. centres, 9 in. × 3 in. purlins, 3 in. × 2 in. rafters, 7 in. × 2 in. ridge, 4 in. × 3 in. plate, 5 in. × 2 in. ceiling joists covered with 1 in. fibre-glass. Roof covered with hand-made sand-faced pantiles on battens and felt, with 9 in. projecting eaves, boarded on soffit.	Basic
(*b*) T.D.A. roof trusses to 20° pitch at 2 ft. centres covered with three-layer built-up bituminous roofing on 2 in. straw slabs, in lieu of basic traditional construction.	+17%
(*c*) T.D.A. roof trusses to 20° pitch at 6 ft. centres, rafters, purlins, and 22-gauge patent aluminium roofing and battens, with 1 in. fibre-glass over ceiling joists instead of basic traditional construction.	+30%
(*d*) As item (*c*) but 1 in. boarding in lieu of battens and covered with 14-gauge zinc roofing instead of aluminium.	+37%
(*e*) As item (*c*) but 1 in. boarding in lieu of battens and covered with 24-gauge copper roofing instead of aluminium.	+75%
(B) Flat roofs, 21 ft. span	
Roof designed to take 20 lb. per sq. ft. superimposed load and point load of 220 lb. on any one place:	
(*a*) 8 in. × 2 in. timber joists at 24 in. centres, No. 2. 8 in. × 6 in. steel beams, 2 in. wood wool and 2 in. minimum vermiculite screed laid to falls, painted plywood fascia, three-layer built-up bituminous roofing finished with mineral chippings.	+28%
(*b*) In situ reinforced concrete roof slab spanning between reinforced concrete beams and with upstand all round to form fascia, 2 in. minimum vermiculite screed laid to falls, three-layer built-up roofing as Item (*a*).	+29%
(*c*) As item (*b*) but finished with ¾ in. mastic asphalt to B.S. 988.	+37%
(*d*) Patent steel decking spanning 12 ft. between 8 in. × 6 in. steel beams and covered with 1 in. insulation board, three-layer built-up bituminous roofing as Item (*a*).	+65%
(*e*) As (*d*) but patent asbestos cavity decking covered with ½ in. insulation board and three-layer built-up bituminous roofing as Item (*a*).	+71%
(*f*) As item (*d*) but patent aluminium decking.	+95%

Data supplied by Stillman and Eastwick-Field, Architects, and Harry Trinick and Partners, Quantity Surveyors, from ARCHITECTS' JOURNAL of 25 October 1956, and 24 January 1957.

Roofs

There is a wealth of experience to show that for buildings which can be adequately planned in simple rectangular shapes of moderate span, the most satisfactory roof is the pitched roof of slate or tile. It is the cheapest of the 'permanent' roofs in both capital and maintenance cost; it can be treated in an infinite variety of ways and, given a good overhang at eaves and verge, it affords the best possible protection from the elements to the walls below.

The fact that this eminently satisfactory form of roof is nowadays so much out of favour with architects, indicates that the profession is not nearly so sensitive to cost as it thinks it is and that it must analyse its reasons for selecting other types of roof far more carefully than it has been doing in the recent past.

Whilst it is true that some buildings do not lend themselves to being planned in simple rectangular shapes, it is also true that very often the attempt is not even made. To avoid the discipline of working to a limited number of moderate spans makes planning much easier, and once this easiness ('freedom' it would be called, of course!) is accepted as a principle, the tendency is for it to be demanded always, irrespective of the merits of the case.

Table V which follows gives the percentage increase in the cost of roofing a simple rectangular building by means of various types of sheet materials over and above the cost of a well-insulated roof of hand-made sand-faced pantiles.

Of the nine county and county borough authorities approached, seven placed roof covering problems either first or second on their list of maintenance items, painting and decorating excluded, in order of either cost or frequency of recurrence. In none of these cases was the traditional pitched roof involved, though a number strongly recommend a return to its use. Bitumen felt roofing came in for the heaviest complaints, as experienced both on flat and pitched roofs, the only authority failing to mention it having used very little of it. Three of the nine authorities recorded serious maintenance problems with asphalt on flat roofs constructed both of boarding and concrete.

(A) *Bitumen-Felt Roof Covering*

In view of these expressions of dissatisfaction with built-up felt roofing, coupled with the withdrawal of the manufacturers' guarantee, it will perhaps be of value to deal with felt roofs in some detail.

(i) *Durability.* Generally speaking, the durability of a built-up felt system depends on the quality and weight of the felt and on the total amount of bitumen present. The layers of felt serve primarily to sandwich together the layers of bitumen which would flow if laid in one thickness. Thus the greater the number of layers, the more durable is the felt system and with a good quality felt (asbestos fibre is recommended) a sufficient number of layers, good detailing, good workmanship and reasonable maintenance, a felt roof can last many years.

Bitumen and bituminous felts gradually deteriorate when exposed to the weather, the bitumen tending to harden and become brittle, whilst the felt may blister, pit, fold and crack.

Blistering of the felt, a common defect, is caused by trapped moisture, a condition which is difficult to eliminate in this country. Whilst the moisture may be trapped in the felt during manufacture, more frequently it is trapped either between the layers of felt or between the roof deck and the felt, due to laying in damp weather. If the felt is being laid on a concrete roof the moisture may come from the deck itself. Once the moisture is trapped, alternate heating and cooling produce blisters of water vapour which eventually burst, allowing deterioration to set in.

Folding, which may or may not be an extension of blistering, is another defect commonly caused by thermal movement of either the roof deck or the felt itself. Folding occurs due to failure of the bond between the successive layers of felt or between the felt and deck. Folds tend to grow in size and may prevent the shedding

of rain water, which, due to the fact that standing rain water causes crazing of the bitumen and loss of the mineral granules, leads to further deterioration. The danger of folding is that the crowns of the folds may crack, particularly if walked upon.

Trials in America have shown that smooth-faced roofing felts weather more rapidly than felt surfaced with mineral granules. It should be appreciated, however, that an inevitable loss of granules is caused by normal weathering and that this is accelerated by standing puddles.

(ii) *Deck Design.* The design of the roof deck greatly influences the life of the felt. Smooth even surfaces free from depressions are required and as standing puddles are definitely bad, it is desirable that the deck itself should be laid to a fall of 1 in 60.

Whilst, generally, reinforced concrete decks are more suitable than timber decks for felt finishes, precautions are necessary to avoid damage to the felt by thermal movement of the concrete. The use of expansion joints, good quality, well-cured concrete and aggregates less subject to movement (thermal movement of a sand gravel concrete is double that of a limestone concrete) is advocated. The cracking of underlying screeds is a potential source of trouble. When lightweight concrete screeds are used for insulating purposes it is essential to ensure that sufficient water evaporates from the screed before the felt is laid—no easy problem. If water is left in the screed it is almost certain to cause trouble.

Details of eaves, verges, flashings, expansion joints and abutments all require special consideration.

(iii) *Protection from Sunlight and Heat.* A layer of light-coloured aggregate both reduces the actinic effect of sunlight and also reflects a good proportion of the heat. The need for such a finish under normal conditions in this country is, however, refuted by one well-known manufacturer, whilst an equally well-known competitor advocates a finish of limestone chippings.

The various types of insulating material used on the roof to improve comfort conditions in the building may affect the performance of the roofing felt system in a number of ways. Lightweight insulating materials are not moisture proof, and water or water vapour rising from a solid concrete roof deck will pass right through them to the underside of the felt, possibly causing blistering, whilst any moisture in the lightweight insulating material itself will also contribute. Another factor often missed is that an insulating layer works two ways; thus insulation placed immediately below a felt system, whilst preventing heat penetrating below, will cause heating up of the felt itself and reduce its durability accordingly. If the insulating layer is placed below the deck or slab it will, likewise, raise the temperature of the deck, but this can be safeguarded by providing a sufficiency of expansion joints. In either case reflective surface treatment to protect the felt becomes of even greater importance when roof insulation is provided.

(iv) *Laying of Felt.* Felt should be laid during dry weather, using a hot oxidised bitumen for bonding. Felt may be bonded to concrete roofs over its whole area with hot bitumen or laid essentially loose, many contractors securing the underlayer only at eaves, verges and perhaps additionally in a 6 in. wide strip at 10 to 15 ft. intervals. Loose laying, in locations where winds are unlikely to strip the roof either by direct lifting or suction, has the advantage of allowing the deck to move without causing folding and blistering of the felt. It is relevant to note that mastic asphalt, whose weight is sufficient to resist wind-stripping, is invariably placed on loosely laid felt.

(v) *Life and Maintenance.* Up to a few months ago architects were able to assure those clients—and there were many—who questioned the life of felt in comparison with that of a traditional roof, that the manufacturers would guarantee the water-tightness of the material for periods of from 10 to 20 years. There is little doubt that the architects themselves were encouraged to put their faith in felts partly on the strength of this somewhat exceptional undertaking and therefore the withdrawal of the guarantee at a time when many architects were experiencing their first serious maintenance problems naturally caused a fluttering in the dovecotes. It is open to question, however, whether it caused much real surprise. The foregoing notes clearly indicate the many possible sources of deterioration of felts which in themselves may be intrinsically sound—trapped moisture, faulty deck design, inadequate protection from thermal movement, wrong positioning of insulation, unreasonable foot traffic—and in the face of all these possibilities it is hardly surprising that the felt manufacturers found their position untenable. Nor will it be surprising if in future architects use less felt roofing.

It is recommended that built-up felt roofs should be inspected at regular intervals of about five years and maintenance in the form of a dressing of hot oxidised bitumen blinded with grit carried out before—not after—defects occur. In practice, however, it often appears that individual defects become apparent—cracks on folds, for example—long before there is evidence of any general deterioration of the roof surface as a whole. In such cases the affected part of the roof should be cut out down to the deck and relaid with new felt, bonded to the deck with hot bitumen, the new felt overlapping the existing by 3 in. to 6 in. all round. If the felt is smooth faced no special treatment is required to the old surface, but if there is a finish of limestone or other chippings, however, they should be carefully removed by the application of a heated shovel before sticking down the new felt.

Manufacturers claim that neither pebbles nor chippings, smooth or sharp, penetrate the felt if properly laid on two coats of special mastic solution.

(vi) *Spread of Fire.* The part played by bituminous roof coverings in a number of serious fires which occurred since 1954, including the Jaguar fire at Coventry in February this year, is described by the Fire Protection Association in their technical information sheet No. 4004.

In the case of the Jaguar fire the roof comprised bitumen-coated corrugated metal sheeting underdrawn with soft fibreboard. Of the other nine outbreaks referred to, in four cases the bituminous covering was on metal sheeting with no lining and in the other five the bituminous covering was either on a combustible deck or on a deck which was lined with combustible material.

From the experience of these outbreaks the Fire Protection Association draw the following inferences:—

'Bituminous roofing material is in itself a serious enough fire hazard, but when, in addition, there is a combustible deck or lining, and in particular a lining of soft fibreboard which is notorious for the speed with which fire spreads over it, the hazard is very great. Bituminous roof coverings may spread fire in two ways, by direct flame-spread along the surface of the roof and by the dropping burning material. Furthermore, the heat from the burning bitumen may assist in bringing about the early collapse of the decking it purports to protect. . . . It is most desirable that any decks on which bituminous roof coverings are laid or any lining with which they are under-drawn should be non-combustible.'

Whilst resistance to fire is only one special aspect of durability it is, nevertheless, of considerable economic importance for there can be nothing more wasteful than complete, sudden and unexpected destruction of part or the whole of a building.

(B) *Roof Linings*

(i) *Fire Resistance.* One of the greatest advances made in building in this country since the war has been in the direction of giving improved comfort conditions in regard to temperatures. Our reputation for being the only nation in Europe which was quite content to freeze in winter and melt in summer is rapidly diminishing and we are at last beginning to insulate our buildings.

Unfortunately the properties which cause a material to be resistant to heat do not necessarily make it resistant to fire, and it is therefore important to ensure that the materials used to provide thermal insulation to the roof do not unduly expose the building to fire risk.

On this question the Fire Protection Association have issued a useful and objective report in their Technical Information Sheet No. 4002. Starting by quoting an example of an industrial building with walls and roof of corrugated asbestos cement sheeting in which heat losses can be reduced by as much as 88 per cent by using a suitable lining, the Association stresses the importance of careful selection of lining materials.

Untreated fibre boards, compressed strawboards, and untreated hardboards

TABLE VI

Schedule of Thermal Conductivity and Combustibility of Insulating Materials

(1) Material	(2) Thermal conductivity ('k')	(3) Incombustibility	(4) Spread of flame (B.S. 476 test)*	(5) Notes
Slag wool (loose)	0·23 to 0·30	Incombustible	Not applicable	If quilted, fire tests will vary.
Corkboard	0·27 to 0·30	Combustible	Not tested	Can be plastered with Keenes.
Insulating gypsum plaster-board $\frac{3}{8}$ in. thick	0·34†	Combustible‡	Class 1	Supplied in $\frac{1}{4}$ in., $\frac{3}{8}$ in., and $\frac{1}{2}$ in. thicknesses.
Fibre building board	0·37 to 0·45	Combustible	Untreated—Class 4 Two coats paint—Class 2 Plastered—Class 1	
Wood wool building slabs ..	0·57 to 0·80	Incombustible	Class 1	Made of wood wool cemented together and compressed.
Strawboard	0·60	Combustible	Untreated—Class 3 Distempered—Class 2 Plastered—Class 1	Made of compressed straw covered with stout paper liner.
Asbestos insulating board	0·75	Incombustible	Not applicable	
Exfoliated vermiculite concrete	0·7 to 1·0	Incombustible	Not applicable	For use as roof and floor screed or in the formation of precast slabs for roofs and partitions.
Foamed slag concrete.. ..	1·7 to 2·35	Incombustible	Not applicable	Ditto.
Clinker concrete	2·3 to 2·8	Incombustible	Not applicable	Ditto.

* Classification of surface spread of flame: Class 1, surfaces of very low flame spread; Class 2, surfaces of low flame spread; Class 3, surfaces of medium flame spread; Class 4, surfaces of rapid flame spread.

† Thermal resistance for $\frac{3}{8}$ in. thick board.

‡ Classified as combustible because of the paper lining.

'k' = heat flow in B.T.Us. per sq. ft. per hour per 1° F. for 1 in. thickness.

are regarded as presenting a fire hazard as they encourage rapid growth of fire. Even when these materials are treated with flame retardants it is claimed that, whilst the development of fire is restricted up to a certain stage, flammable gases are eventually given off in sufficient quantities to accelerate the spread of fire. Linings of plasterboard, asbestos insulating board, and wood-wool cement slabs, on the other hand, do not in themselves present a fire hazard.

Cavities between linings and roof coverings cause increased fire risk and where unavoidable should be broken up into small sections isolated by incombustible material. It is particularly important to avoid a cavity between lining and covering where the lining itself is combustible.

Table VI shown above gives a list of insulating materials in common use in order of degree of thermal insulation with corresponding notes as to incombustibility and flame-spread. In this connection the book issued by the Building Research Station, *The Thermal Insulation of Buildings: Design Data and How to Use Them*, by Nash, Comrie and Broughton, is an excellent work of reference (H.M.S.O., 1955).

(ii) *Moisture Absorption.* A familiar defect in roof linings is to see them sagging, ungracefully, between fixings. Great care should be taken to ensure that those which readily absorb moisture and move in so doing are stored in a dry place and not fixed until the building itself is reasonably dry. Another cause of sagging is that fixings are often located too far apart. Where humidity is likely to be excessive, organic linings such as fibreboard should be avoided as a supporting layer for felt or other sheet roof coverings because of their liability to deterioration under such circumstances.

(C) *Fixing of Lightweight Roofs*

In traditional building one is accustomed to designing structures in order to hold roofs up, but with many of the lightweight roofs it is just as important to design to hold them down. There have been numerous examples in recent years of roofs being blown off by gales and a factor sometimes lost sight of is the effect of wind getting at the underside of roofs via a window inadvertently left open. The lifting effect of a high wind on lightweight roofing under these circumstances may be imagined and points to the need for security in anchoring roofs to supporting walls or frames and also to the avoidance of unsecured overhangs of eaves and verges and inadequately detailed drips of roof sheeting materials.

Conclusion

The more one thinks about the present-day problems of building structure the more one realises that the fundamental difficulties spring from two principal sources:—

The first is the more obvious one of the inevitable transition from the use of hand-made materials and hand-worked building components to the dry factory-made building elements of panels or sheets simply assembled on the site.

The second is that a progressive civilisation is, naturally, demanding living and working conditions of a kind that in the past was not expected—better thermal and sound insulation; quicker completion of buildings; higher standards of fire protection.

Arising from the first source, it may be inevitable that until adequate experience has been obtained as to the capacity of the newer materials to withstand the weather and continuous usage there will be teething troubles in the early years.

Arising from the second source is a conflict between the properties of the new materials when applied to practical building, the most serious of which is, perhaps, that a material produced to give lightness of weight and ease of erection may have inadequate thermal or sound insulation properties or be insufficiently resistant to fire.

It is important that the client—be he private building developer or local authority—should know something of the complex scientific problems which beset the architect today, and it is even more important that architects themselves should fully realise the necessity of a thoroughly scientific and realistic approach to present-day building. The use of fashion and cliché for their own sakes—all too tempting in this heyday of the glossy technical journal—must be firmly resisted.

Nevertheless, the comparatively carefree days of the Revivalist are gone and both client and public must realise it. The building industry is inevitably and irrevocably out on the wing with relatively untried materials and techniques and must use every endeavour to solve its new problems. Whether the industry is, in fact, doing all it can to solve them is a matter which this Conference might well debate. It may be asked whether too many new materials are being put on the market too quickly. Whether the manufacturers in the industry are spending sufficient time and money in development to ensure as far as possible that the performance of their materials will be satisfactory. Whether they are sufficiently interested in the finished building or are content merely to sell their product. Whether building research should be left to the Government or whether the industry itself should take a much greater share than it does at present. Whatever the answers, it is certain that additional expenditure on research would save infinitely greater

TABLE I

Percentage of Capital Cost represented by the Services in Typical Building Types (excluding site works other than drainage)

Services	Small house	4-storey maisonettes	11-storey maisonettes	Schools primary and secondary	11-storey office blocks (*f*)	11-storey office blocks (*g*)	Hospital ward units	Research laboratories
	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent
Heating	4·1 (*a*)	3 (*a*)	13	10			7 (*e*)	
Hot water	2·2	3·3	(*b*)	(*p*)	7	13		13 to 23 (*c*)
Mechanical ventilation	—	—	1 (*h*)	0·1			—	
Cold water	0·8	2·2	2·3					
Sanitary fittings	3·6			1·7				
Sanitary plumbing	1·1	5·3	4	1·8	5	5	7	15 (*d*)
External plumbing	2·3			0·3				
Gas	1·0	0·5	0·4	0·1	—	—		
Electrics	3·3	3·7	3	4·5	7	8	6	8
Lifts	—	—	3·3 (*j*)	—	5	7	—	—
Miscellaneous	2·0 (*m*)	1·0 (*l*)	3 (*k*)	—	—	—	—	—
Drainage	3·6	1	1	2·5	1	1	2	4
Total	24	20	31	21 (*n*)	25	34	22	40 to 50

NOTES: (*a*) Open fires and flues. (*b*) Central heating; proportion is 6 per cent if fires and flues only. (*c*) Higher figure including full central heating plenum and ventilation system, fumes extracts, constant temperature rooms, etc. (*d*) Cold water, compressed air, chemical plumbing, etc., also includes 9 per cent for laboratory fittings. (*e*) Includes percentage central boiler-house. (*f*) A block with average standards. (*g*) A deep block with full air-conditioning and mechanical ventilation and very high standards. (*h*) Internal bathrooms and w.c.s. (*j*) Assuming 80 dwellings per two lifts. (*k*) Laundry 2 per cent; refuse chutes 0·7 per cent. (*l*) Refuse chutes. (*m*) Fuel store, dustbin and enclosure. (*n*) From published analyses there seems to be no great difference between primary and secondary schools. In both classes the total proportion of services varies from 17 to 25 per cent. (*p*) Ministry of Education Bulletin No. 13 gives a range in actual installations of from 5 to 15 per cent of total cost.

expenditure on the capital and maintenance costs of buildings.

Architects, whose prime responsibility is to give their clients value for money, must continue to emphasise the need for more research. Whilst doing so, however, they can themselves, by pooling their experiences and by collaborating with the Building Research Station, go some considerable way towards fulfilling this vital obligation.

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The following is a short list, by subjects, of most of the services, some of which are not mentioned in the above table. This does not include factory or works processes, petrol and oil supplies, etc.:

Heating	Water supply	Electric lighting	Gas
Hot water	Sanitary plumbing	Electric power	Refrigeration
Ventilation	Rain water	Lifts	Sprinklers
Air conditioning	Fire mains	Lightning protection	Refuse disposal
Steam	Drainage	Conveyors	Incinerators
Compressed air, etc.		Telephones	
		Radio and television	
		Alarm systems	
		Other telecommunications	

A. W. CLEEVE BARR [*A*]

The Services

AT THE START, may I make it clear that I am not a heating engineer, a ventilating engineer, a sanitary engineer, an electrical engineer, a mechanical engineer—not a specialist in any sense of the word on the services in buildings, and I am extremely indebted to a number of engineers and architects who have very kindly helped me with this paper.

My main object is not to pursue the complex problems of each of the services in great detail but, more widely, to discuss them in relation to the architect's overall responsibility for integrating the services within the general economy, design and life of buildings.

Firstly, I shall try to indicate the importance of the services and their rapid development; secondly, to outline typical problems in regard to the major services, heating, electrics and plumbing; thirdly, to comment particularly on the significance of architect-engineer relationships so far as the theme of this Conference is concerned.

The services, as we know them, are still comparatively new elements in building, and, in regard to materials and to technologies even, they are still developing rapidly, in common with the electrical, chemical and mechanical engineering industries to which they are closely related. By new, I mean that most services are products of the last hundred years—if we disregard the rudimentary forms of heating and drainage in use in ancient times—and, as for still developing, one has only to think of radio-diffusion, television, refrigeration, built-in vacuums, refuse comminutors (or insinkerators?) to wonder what is coming next. This 'marvel of the age' aura with which engineers, and the public, like to invest their playthings reflects an attitude of mind which never sees the services as *part* of a building. They are creations in themselves, with important demands for servicing, for renewal, for replacement, for alteration, for access at all times. The building is there to hold them up. To what extent these demands are justified and how they affect costs is one of the themes I shall try to keep in mind.

Of course, there is one service to which this 'marvel of the age' idea hardly applies—sanitary plumbing. This particular science came in with a bang, in the bye-law era in the second half of the last century, but, like Dopey, has been falling behind ever since—at least until quite recently, when the B.R.S. gave it a good shaking.

Table I shows a list of the most usual services in buildings and, in parallel columns, the percentages of capital costs which these services represent in various typical building types. It will be seen that the total proportion of capital expenditure represented by the services varies from around 20 per cent in low-storeyed residential and educational buildings to as

much as 50 per cent in some kinds of laboratories. These figures include, so far as I could isolate them, only the cost of the service installations themselves. If one tried to take into account all the elements of superstructure and finishes, which exist mainly to support, conceal or give access to the services (bearers, ducts, lift shafts and so on) one would need to add on at least another 5 to 10 per cent.

It will be seen at a glance how few of these services were available in buildings fifty to a hundred years ago. When people decry, in a general way, the continuous rise in the cost of building, it should not be forgotten that the character of buildings in themselves is continually changing—think for a moment of the differences between pre-war and post-war schools—and that the continuous rise in the standards of amenity, which is very largely reflected in the cost of services, is itself a major factor in increased costs.

The cost of structure over the years by competitive ways of achieving the same end should relatively have decreased. The cost of finishes, relatively, has certainly decreased on account of the economic outlook and general austerity of our times. It is the services which are responsible for by far the largest percentage increase in the cost of buildings. The question is, are we now spending too much on the services relative to the amenities they provide? Now that we have at last begun to talk about cost planning at the design stage—and a few even to practise it—are we spending too much on boiler-houses and plumbing, and too little, for example, on finishes which are all too easy to strike out at the last moment? I have a hunch that we are. I cannot prove it—the statistics for a general proof are not available. I can only offer some evidence. It would be of great value if members of the Conference would contribute on this theme from their individual experiences.

I propose now to discuss some typical problems of the three most important groups of services—heating (with hot water and ventilation), electrics (lighting, power and lifts) and plumbing (water supply, sanitary plumbing and drainage).

Heating

In the majority of buildings the relation of capital cost to running cost is one of the most important factors affecting the design of the heating (hot water supply and ventilating) system. In industrial buildings the expense of any interference with production due to maintenance work may itself be a major factor in deciding the form of heating (as of lighting and other services).

In hospitals the medical necessity of avoiding breakdowns in services, particularly in operating theatres (again in lighting and electrical services, as well as heating), may be paramount and require duplicate or reserve plant, and rule out certain systems. In housing, the economic issues are further complicated by the subsidy arrangements and by the uncertainties as to what the individual tenant can afford.

TABLE II

Economic value of insulating a factory roof in relation to cost of heating

Assume factory covered with corrugated asbestos cement sheeting. It is proposed to line the roof on the underside. Mean temperature required in building 55° F. Mean external temperature 45° F.

'U' value of unlined roof	1·40 B.t.u./sq. ft. h. °F.
'U' value of lined roof (say)	0·40 B.t.u./sq. ft. h. °F.
Reduction in thermal transmittance	1·00 B.t.u./sq. ft. h. °F.
Mean temperature difference	10° F.
Reduction in heat flow per sq. ft. per hr.	10 B.t.u.
Length of heating season (say) 33 weeks	5,500 hrs. approx.
Reduction in heat flow through roof for season	55,000 B.t.u./sq. ft. = half a therm per sq. ft. of roof.

If the heating system provides heat at 8*d.* a therm, the saving due to the insulation will be 4*d.* per sq. ft. of roof, or 3*s.* per sq. yd. If the insulation costs 18*s.* per sq. yd., the capital outlay would be equalled by the saving in the cost of heating in six years.

If the mean temperature difference or the cost of heat is greater, the period will be reduced; if the heat is supplied at 1*s.* 4*d.* a therm, the period will be reduced to three years.

The difficulties of assessing the way in which a system will be used by the occupiers—for example, the consumption of domestic hot water in a housing scheme or the ventilation rate of classrooms in a school heated by warm air—are factors which sometimes lead to avoidable over-design.

Thermal Insulation: In assessing the relationship between capital and running costs, the question of thermal insulation is of vital importance. This is still insufficiently appreciated. For example, in a sketch design for a block of flats, alternative elevations were recently prepared with windows in one case equalling 50 per cent, in the other 25 per cent, of the floor area. The difference in heat loss between the two, all other factors being equal, represented 10 per cent of the total heat loss from the dwelling. In terms of fuel consumption per week (using the figures given later in Table III) the flat with the bigger window areas would have paid 10*d.* more per week in a normal central heating scheme, and 1*s.* 7*d.* more per week in an electric floor-warming scheme, than the flat with the smaller window areas. (These figures could have been reduced by double-glazing, but the weekly debt charges on the extra capital cost would have been several shillings per week.) Overglazing in blocks of flats, like unlined roofs in factories, represents an extreme case of inadequate thermal insulation which is too often overlooked.

The B.R.S. handbook, *Thermal Insulation of Buildings*, gives an example, which shows how to assess the value of insulation compared with the cost of heating in relation to a factory roof. The example is reproduced as Table II.

Four examples are given, with illustrations, in M.O.W. Technical Note No. 3 of large factories which have saved money, as well as increasing output and improving working conditions by insulating roofs. In one of them the Gloster Aircraft Company in 1955 spent some £3,500 on insulation costs which will be paid for by the fuel saved in less than two years. Similarly, the Northern Aluminium Company in 1948 spent over £8,000 on insulation which was paid for by fuel savings in about three years. These demonstrate quite dramatically that thermal insulation is a calculable business investment.

Housing: In regard to small house design, the B.R.S. have performed a national service by their full-scale heating experiments. These have not only demonstrated in practice, and with ordinary tenants, that less fuel is used in well-insulated houses than in poorly insulated ones, but they have also shown that the methods normally used for estimating the overall heat requirements in, say, office buildings are inappropriate for houses. As a result, new and comparatively simple criteria are now available[1] by means of which any architect can, for a house of given floor area, work out quickly for his client not only a comparison of capital costs, using any of the normally accepted methods of heating and hot-water supply (from open fires and back-boilers to ducted warm air or electric floor-heating), but also an estimate of the annual fuel consumption for a variety of fuels and conditions. This is a great step forward.

The following example, Table III, in relation to multi-storey housing, is given not for the intrinsic validity of the figures but because it illustrates (*a*) the make-up of running costs, (*b*) the complexity of finance in subsidised housing, and (*c*) the economic possibilities of off-peak electric floor-heating in housing in the future. It will be seen how heavily handicapped the normal central heating installation is by its high capital cost, by high interest rates and by comparison with the open fire standard. Obviously the cost per dwelling of central heating depends very much on the size of the scheme and the compactness of the planning. There are few schemes, however, in which the capital cost per dwelling can approach the cost of traditional heating, in order to come within the normal ceiling figures for subsidised housing, so that a proportion of capital cost, representing the extra for central heating, is usually amortised and charged separately to the tenant, as an addition to the rent.

[1] B.R.S. Digests Nos. 93 and 94.

The possibility should be noted with electric floor-heating of providing a more economical service, as Table III B (ii), comparable in cost with the traditional open fire and back-boiler, but with a better distribution of heat. It is not practicable to give such a reduced service with normal central heating, Table III A, since the reduction in consumption costs would be very small in comparison. Surveys carried out by both Electricity and Gas Boards show that where there is individual control of apparatus, an annual consumption of only 120 therms for heating and 80 therms for hot water (150 gallons per week) is general. This is also borne out by the economic but highly successful electric floor-warming installation built in a mixed development housing scheme by the Borough of Kirkcaldy.

Critics have attacked the use of electricity for heating on the grounds of its low efficiency in terms of coal consumption at the power-house. The future use of nuclear power for the generation of electricity should in the long run, however, make it abundantly available at a level of cost which relative to other sources of power must tend to become increasingly more economic.

Again, the use of electricity off-peak, with coal-fired generating stations, is economically advantageous, but with nuclear power stations it will, according to the experts, be quite uneconomic to reduce output at nights and the availability of off-peak loads will become critical to the proper exploitation of the power industry.

Schools: In regard to heating systems for schools the Ministry of Education Bulletin No. 13 reveals that the capital cost of installing a heating system represents anything from about 5 to 15 per cent of the net cost of the building. The range in consumption costs of fuel is also extraordinary. The main conclusions of the Bulletin are, in relation to schools generally, but particularly in regard to classrooms, that while floor-warming offers possibly the most comfortable form of heating, the most economical and flexible is warm-air with the traditional radiator system coming in all respects somewhere in between. Given good design and flexible controls, the amount of heat required for a classroom to achieve broadly the same conditions by the three systems commonly in use—warm air, radiators and floor-warming—is in the ratio of 1 to 1·1 to 1·25. Heating engineers have challenged these figures on the grounds that the maintenance (renewal of fans) and cleaning of warm-air units adds appreciably to the running costs, so that, taking all things into account, the radiator system is the most economic. One hopes that the Ministry of Education will be able before long to turn its attention to maintenance problems. A series of bulletins on the various aspects of maintenance in post-war schools would be of very great value.

Bulletin 13 reveals that 'the higher consumptions by the coal-fired radiator and floor-panel systems were almost certainly due to maintenance of high flow temperatures at nights and week-ends, which in turn was due to the absence or imperfect use of proper control instruments (or to an inherent inability in the system) to profit from intermittent operation.' When one considers that schools are occupied for only about 140 hours out of 720 hours per month, the maintenance of 'high flow temperatures at nights and week-ends' is a really serious matter. It is to be hoped that no architect or engineer is being tempted at the moment to make capital economies at the expense of such controls!

The problem in regard to capital economies is to avoid making false economies. Obviously there is a strong prima facie case from the Ministry's own figures that many heating installations in schools have not received the same cost pruning as other elements. The wide range in capital costs, from 5 to 15 per cent of the total cost of the building (Table I), for school heating designed to prescribed and common standards, is unlikely to be accounted for entirely by differences in plan shape, structural form, U-values and so on. This is borne out by the fact that in such schools as have been directly cost-planned by the Ministry or by local authorities in association with the Ministry—where the engineer has been given a target to work within—the cost of the heating and hot-water services have been brought within the lower half of the national range, without sacrificing standards or controls. It would be interesting to know in more detail how this has been achieved.

TABLE III

Comparative costs of (A) normal central heating, and (B) electric floor warming for a small scheme (under 100 dwellings) of multi-storey flats

Assumed: two-bedroom dwellings, heating provided during the winter to living rooms (65° F) and entrance halls (50° F) only, hot water all the year round on the basis of 250 gals. a week. The charges to tenants are in both cases assumed to be averaged over the whole year. Electric heating off-peak overnight plus a midday boost, plus allowance for topping-up in severe weather.

(A) Oil-fired low pressure hot water central scheme, with boilers at ground-floor level serving convectors or radiators in the living room and hall and individual calorifiers for hot water.

Capital costs:	
Capital cost per dwelling, say	£360
Deduct 'equivalent cost' of traditional heating (open fires, back-boilers, flues, etc.), say	£150
Nett capital cost to be amortised and charged to tenant	£210
Running costs:	*s. d.*
Debt charges at 5¾ per cent on £210	5 10
(NOTE: This would be reduced to 3*s.* 10*d.* if interest rates were, say, 3¾ per cent.)	
Fuel	8 8
Maintenance, including share of porter's wages	2 0
	16 6

(B) Electric floor warming, with electric reflector fire for topping-up in living room and electric water storage-heater in kitchen.

Capital costs:	
Capital installation per dwelling, say	£150
Deduct 'equivalent cost' of traditional heating (open fires, back-boilers, flues, etc.), say	£150
Amount to be amortised and charged to tenant	nil
Running costs:	*s. d.*
(i) On basis of 300 therms total annual consumption as scheme (A), electricity costs, say	16 10
or (ii) On basis of intermittent heating and only 150 gals. of hot water (200 therms total annual consumption), electricity costs, say	11 2

Integration of Services with Structure Accessibility

As important as economy in the specialist installation itself, is the problem of its integration with the design of the structure and finishes of the building, not only from the point of view of accommodating the installation but also of providing access for maintenance and so on. If the sizes of spaces required for services can be determined right at the beginning of a job, the structure can be designed in many types of building at no extra cost to accommodate the services within it, avoiding the formation of special ducts. Examples are: deep hollow floors in offices or schools, beams with open webs designed to pass pipes with falls over long horizontal distances, twin beams designed to pass vertical services, and hollow columns. I shall say something about the difficulties of collaborating with engineers in this respect later.

So far as access is concerned I am convinced that all too much money is wasted on elaborate provisions which are rarely used, and that if money has to be saved

initially we can save it here and risk having to spend it to dig things up when a failure occurs. Having said that, let me hasten to add two points. First, obviously one has to use common sense in this matter and access must be provided wherever it is likely to be frequently required (even once every five years is frequent). Secondly, where access is not provided, positive precautions against damp, corrosion, leaks, expansion and sources of trouble must be taken.

In long, spread-out, horizontal buildings —some schools, hospitals, offices and other building types—the traditional basement crawl-way for heating pipes is frequently a waste of money. Not only does it add enormously to the cost of building but it adds considerably to site difficulties and to the time taken in construction. It also often fails in its purpose either due to difficulties in damp-proofing and ventilation, or because the floor above it has to be taken up anyway if major repairs have to be undertaken. Two architects have told me how, by re-designing heating systems for schools with surface boiler-houses in lieu of sunken ones, and by substituting overhead pipe runs with false ceilings, in lieu of floor ducts, they have saved over 1 per cent (over £1,000 in a £100,000 school) on the total cost of the building. Below ground ducts of all kinds, accessible or otherwise, appear to be a frequent source of maintenance trouble, as well as a cause of extra capital cost, and the possibility of their elimination even at extra cost for the installation itself is worth investigating in many types of building at design stage.

So far as the life of materials is concerned there is little doubt that copper pipes in dry and corrosion-free surroundings will last as long as most contemporary building structures. There are also a number of instances of iron pipework being replaced recently in institutions (because the buildings as well as the installations themselves are outmoded) where the pipes are over 50 years old and still in perfectly sound condition. All too little is known of the life of welded steel pipes in closed circuits—which must depend very much on the possibility of air getting into and out of the system—but a number of instances are known of such pipes, 'buried' in good, dense concrete, being in perfectly sound condition after 30 years and longer. So much depends on the kind of building and its function. Elaborate precautions made for the replacement of heating systems (as of electrical and other services) are unwarranted, if it is likely that the operational life of the building, as well as of the installation, will have largely changed in, say, 30 years' time—and, looking back, this has so often been the case in buildings of the last generation. All heating pipes with screwed joints should normally be accessible in case of leaks. If welded steel or copper pipes are 'buried' in concrete or masonry or in sealed voids definite precautions are necessary, which I shall refer to later in discussing cold-water services.

Electrical Work

Lighting: The economics of electric lighting installations are similar to those of heating in regard to the study which must be made, in the interests of the client, of the relation of capital to running costs. It is not, however, a simple matter only of lumens per square foot, and of cost of lamps versus cost of current. The study must include the design of fittings, their number and the role they play in the whole architectural scheme, as well as such problems as the maintenance and cleaning of fittings and of accessibility to them. It must also be related to surface finishes, to colour schemes and to the design of windows and roof-lights. In other words, and depending very much on the type of building, the economics of artificial lighting are very much bound up with the architectural conception of the building as a whole.

The following example, Table IV, is given, again not for the particular validity of the figures themselves, but as an illustration of the way in which the architect, in collaboration with the illuminating engineer, can save the client money by studying alternative solutions to an artificial lighting problem. Needless to add, the study did include, what I have not set out here, the problems of access to the fittings for replacements and cleaning, their means of support and possible interference with the factory work. I am indebted for this example to our first speaker, Mr. Thomas Mitchell.

Telecommunications. This group of electrical services is one in which such rapid advances are now being made that the architect can do little more than ensure that horizontal and vertical chases or ducts are available, with the certainty that new and additional installations will from time to time be required. Even here the appropriate Code, CP3, Chapter VII, optimistically states that 'the required layout of wiring, etc., should preferably be decided during the preparation of the building plans.' Fortunately this is perhaps the least difficult group of services to provide for, so far as main runs are concerned, although the avoidance of individual television aerials on blocks of flats, and their replacement by communal facilities, is a problem beset by social and political difficulties.

Wiring and Accessories. Big advances have been made in recent years in electrical wiring and in the design of many accessories. For many years electrical wiring generally has been regarded as a material with a short life, say 20 to 25 years maximum, on account of its rubber insulation which in time becomes brittle and certainly perishes rapidly in damp or very hot conditions. To permit complete renewal of the installation, electrical wiring is therefore normally run in accessible voids (timber floors, or false ceilings) or in metal conduit (in masonry walls or concrete floors). The development of mineral-

TABLE IV

Comparative costs of alternative lighting installations for a large factory

	Scheme A	Scheme B	Scheme C
Number of fittings	1,668	1,068	552
Load in kilowatts	379	536	569
Capital Costs			
	A £	B £	C £
Fittings	22,068	17,347	10,561
Lamps	2,998	2,516	2,091
Installation	8,365	8,412	5,256
Total capital costs	£33,431	£28,275	£17,908
Running Costs			
	A £	B £	C £
Maintenance, cleaning and lamp replacements . .	9,352	6,327	3,669
Electricity consumption	3,946	5,477	5,762
Total annual running costs	£13,298	£11,804	£9,431

Scheme A was proposed by the client's works engineer himself to provide, in four areas, relative lighting intensities of 7, 10, 20 and 30 lumens per sq. ft., using tungsten, mercury vapour and fluorescent (two areas) fittings respectively.

Schemes B and C were subsequently prepared by the architect to reduce the number of fittings and to reduce both capital and maintenance expenditure.

B replaces the tungsten and the mercury vapour fittings by dual blended fittings having separate reflectors for mercury discharge and gas-filled lamps, but retains the fluorescent fittings in the areas requiring 20 and 30 lumens.

C uses the dual blended fittings throughout with an intensity of 16 to 18 lumens (as against the original 7, 10, 20) and keeps the fluorescent lighting only for a mezzanine area requiring 30 lumens.

A fourth alternative increases the number of dual fittings, thus providing 20·5 lumens generally, but still offers substantial economies over the original scheme.

insulated, copper-sheathed wiring, which is flexible, strong and as permanent as any building structure, has been a great step forward. This is now competitive in price with wiring in heavy-gauge screwed conduit, and in some cases even with light-gauge brazed conduit. Electrical conduit in concrete floors has frequently been a great nuisance during construction, interrupting the sequence of trades, never shown on drawings and following no known course, and all too often filling up with water or condensation and causing corrosion.

If the wiring is to be permanent, however, one should try to ensure that it is likely to be adequate for whatever loading may be anticipated in the life of the building. In schools and other buildings with a fairly well-defined set of requirements, it should not be difficult for clients to state their maximum likely needs. In housing, however, the position is uncertain. Reading American magazines and noting the number of electrical gadgets, power tools, and so on, which the ordinary citizen finds essential to a civilised existence, I have been apprehensive that in a few years' time post-war houses and flats will need to be re-wired to cope with the ever-increasing load. My authority makes provision for 10 kilowatts per dwelling, and I am told that this should cover all foreseeable needs, even say a considerable extension of electrical water-heating or space-heating, since the diversity factor is very large. The point is perhaps worth discussion. The important thing is that tenants or householders should have an adequate number of socket outlets, and these can be most cheaply and safely provided by a ring main (see M.O.W. Technical Note No. 4).

Advances in the design of accessories include better looking and more durable switches, with fewer moving parts, fused plugs and 13 amp. switched socket outlets with insulating shields which cover the live sockets when the plug is withdrawn. Unfortunately these design improvements have not yet spread to pendant twin-flexes nor to lampholders, which must be the least durable items of equipment provided anywhere in buildings. The use of 'Bakelite' as a material for threaded rings and sockets of lampholders seems to me a complete misuse of the material, yet I am told there are over a hundred makes on the market, most of them conforming to the British Standard. My authority approves four makes—of the kind which is interlocking so that the whole thing does not come apart in the hands when a shade or bulb is replaced—but even so they still have 'Bakelite' rings and sockets (brass-lined). Is this the sort of thing that the R.I.B.A. representatives at the B.S.I. could make a really big fuss about?

Lifts. On the subject of lifts, these are relatively such expensive pieces of equipment, both to install and maintain, that a first consideration is to site them so that the maximum economic advantage is obtained from their use, consistent with maintaining the necessary standard of amenity. In multi-storey housing, for example, the standard 100 feet per minute lift installation costs of the order of £2,500 for a five-storey block, £3,000 for a ten-storey block, plus at least 100 per cent addition for the enclosing shaft, foundations, motor room, and so on. One has only to divide these figures by the potential number of dwellings served per lift to realise their significance. The cost per flat in a five-storey staircase-access block (ten dwellings) is, say, £500. In a five-storey balcony-access block (say thirty dwellings) the cost will be only £166. The difference, some £333, represents roughly the difference in cost between these two conventional types of dwelling.

On the other hand, one must add a warning against taking this particular kind of economy in planning too far, and note that above six storeys in height the Ministry has always and still does recommend the provision of two lifts as a necessary amenity because of the considerable percentage of time during which each lift is out of use for servicing.

On a typical housing estate the lifts are serviced once a fortnight, and in addition breakdowns occur which average at least once in six weeks per lift. This in spite of the fact that over the past ten years the whole subject has been exhaustively studied by engineers to render lifts as fool-proof and maintenance-free as possible. The cost of maintenance (excluding current consumption) is around £55 per year per lift, and some 50 per cent of this is due to misuse. There is something about unattended lifts which seems to bring out the very worst responses from suffering humanity. I only mention the matter here as an extreme example of avoidable maintenance, which, apart from doubling the annual maintenance expenditure, is itself a reason for duplicating the initial service, and therefore of doubling the capital cost in blocks over six storeys in height.

Water Services, Sanitary Plumbing and Drainage

Accessibility and Corrosion. I have already referred to the problem of burying pipes and to the fact that not only can a building be made to look a lot tidier, but that useful capital economies can be achieved if removable access covers are restricted to a minimum. Provided that precautions are taken against freezing, and against corrosion, there would seem to be no good reason why copper pipes for cold water supplies, once tested, should not be covered up and expected to last out the life of the building. Protection against corrosion is, however, vital and a most important factor is to avoid damp. I was told recently by a county architect of a school in which the whole of the copper water services, buried in chases in the site slab, had to be replaced—the copper had been attacked by a foaming agent used in the concrete mix. If the site slab and the copper pipes had not been subject to rising damp, this would not have occurred. Calcium chloride used in a concrete mix, or even a filling of ashes to a chase, given a damp situation, will produce corrosive acids.

From the museum of the same architect I was also shown the remains of copper pipes from similar situations which had been corroded by urine or by patent plasters and other impurities left by workmen. This architect, who is also responsible for maintenance, is still of the opinion that in the great majority of cases he is justified in burying his cold water services in this way, but now takes special precautions to see that the chases are kept clean and dry, and are covered as soon as the pipes have been tested.

Again, the same museum has some fine examples of the remnants of iron pipes which have been taken from ducts in which persistent condensation, formed and held within the lagging of the pipes, had rusted them completely through from the outside. Whether access is provided or not dampness and condensation within ducts are to be avoided at all costs.

Corrosion, as a result of electrolytic action between dissimilar metals, is another all too frequent source of maintenance. The interaction of copper and galvanised iron used in the same water system is by now fairly well known, but the corrosion of aluminium flush pipes, for example, used with copper water services is another bad source of failure not yet so widely experienced. By and large, dissimilar metals should not be used in the same water system. In all cases of doubt the advice of the local water authority should be obtained.

Valves. Ball-valves have been a nuisance from the maintenance point of view since they were first invented. The cost of a washer is coppers, but the cost of sending a man to replace it in a tap or a ball-valve is shillings. The B.R.S. has recently made a considerable contribution by studying scientifically the operation of traditional types of ball-valve, by diagnosing the physical causes of their rapid breakdown and by designing a new type of valve which has just been given its first twelve-month trials by a number of local authorities. The results are most encouraging. Not only is the new valve likely substantially to reduce maintenance costs, but (and it is now being produced by two firms under licence) it is 20 per cent cheaper on first costs than the British Standard. Can we hope that the Station will now turn its attention to taps and other valves generally?

Frost. Every winter in this country, when the temperature drops below freezing for a few days at a time, there is a fantastic national expenditure, of the order of several million pounds a time, for repairing burst pipes and cylinders—apart from the damage to decorations and furnishings and the devastating interruption to domestic life which we bear with a kind of grumbling martyrdom. Admittedly, a large proportion of this damage could be avoided by better heating and by more intelligent householder or tenant precautions, but the bulk of it could also be eliminated, as far as new

buildings are concerned, by proper precautions at the design stage.

The measures recently taken in regard to houses and blocks of flats by my Authority, the London County Council, in this connection are of interest. The Council was already insulating external walls and flat roofs generally to a reasonable standard, lining pitched roofs with sarking paper and keeping all pipes inside dwellings, except for those in roof spaces and ducts which were lagged. It was decided, in the light of experience, however, that it would be well worth while to improve the standards of the lagging in roof spaces and ducts (glass or mineral fibre in lieu of hair felt), to use sarking felt in lieu of paper, to keep all ducts under instead of over flat roofs, and in certain instances (house roof spaces, for example), to use plastic piping (lagged) in lieu of metal. The additional cost of these measures was of the order of £5 a dwelling. It was decided not to adopt a system of running low-temperature, thermostatically-controlled electric cables alongside all cold water distribution and expansion pipes (grouped) within the lagging, the additional cost of which would have been some £15 a dwelling. These figures give the interpretation, by one authority, already taking above average precautions against frost, of the justifiable extra capital cost involved in making a dwelling as proof against damage as intelligent planning and insulation can make it.

The use of plastic piping in itself, of course, does not stop freezing, and if the water service is to be continuous in cold weather, plastic pipes must be lagged like any others. On the other hand, they do avoid bursts.

Sanitary Plumbing. In regard to sanitary plumbing there is little doubt that a more scientific approach to design can materially reduce capital costs, without incurring increased maintenance costs. For example, the old bye-laws, properly reflecting the mingled fear and suspicion with which the whole subject was regarded, required all soil, waste, ventilating and rain-water pipes to be carried to ground outside the building. Architectural considerations apart, this is a more expensive way of doing the job generally from the point of view of capital cost (except perhaps for traditional houses), and of maintenance (bearing in mind difficulties of access, of repainting and of frost damage) than a well-designed internal installation, particularly if the principles of single-stack (unvented) plumbing are followed. On multi-storey housing, for instance, the latter system, apart from builder's work considerations, can save some £12 to £15 per dwelling on plumbing costs.

After the war, certain of the more progressive county authorities made considerable strides, by more scientific design, in limiting capital expenditure on school plumbing, educational buildings being exempt from the bye-laws. Fortunately, the Model Bye-laws, 1953, no longer require the plumbing to be external on other kinds of buildings. However, a great deal more research work and in particular field trials needs to be done on this subject.

The use of plastic piping (p.v.c. and polythene for both water supply and sanitary plumbing) tends to be judged too much by its additional capital cost at present. Apart from its particular value for chemical wastes it is ideal for flush pipes and for wastes and traps. Obstructions can be removed by manipulation of the pipe, although this may not be very good practice. It saves painting, and troubles due to freezing or to electrolytic action between metals or to too acid or alkali water supplies. Its use is certainly likely to increase.

Drainage. So far as drainage is concerned, the problem is how far can one go in making capital economies by reducing falls and sizes of pipes, by saving excavation and by eliminating unnecessary access, without destroying the principle that drains shall be self-cleansing, and without increasing maintenance costs. The Report of the 1954 Joint Committee[2] on this subject is interesting:

'A more scientific approach to design is leading to an increase in the numbers of connections which can be made to 4 in. and 6 in. pipes; figures as high as 20 houses to one 4 in. pipe laid at 1 in 70 and 64 houses to one 6 in. pipe being given. At the same time economy is being effected by the use of flatter gradients than those obtained by "rule of thumb" methods. . . . It is recognised that the planning of manholes needs careful consideration, and that their numbers can be reduced without impairing working efficiency, rodding-eyes being frequently adequate for normal maintenance. The use of intercepting traps (except in special circumstances) is becoming generally less, and some 70 per cent of local authorities do not use them in new work . . . blockages (are) more frequent where interceptors are used, and do not increase in number merely as a result of using flatter gradients. . . .'

The same report reveals that the main causes of blockages in drains, the removal of which costs the local authorities some £500,000 a year, are: sanitary towels (37 per cent), newspaper (23 per cent), rags (11 per cent)—not to mention roller-skates, bottles and bones. At the present time incinerators with flues costing many hundreds of pounds are being installed in blocks of flats which have no open fires, for the disposal of sanitary towels—whereas in America, I understand, the only kinds of towels available are soluble types, which can be disposed of through the ordinary drainage system. The author mentions this problem only because it is one of a number of instances in which low standards of social behaviour are directly responsible for avoidable expenditure in building, both capital and maintenance. Expenditure of a similar sum on social education and hygiene would, from the national point of view, be well worth it.

The office of the Hertford County Architect has carried out some interesting work (presented as a series of information sheets for departmental use) on drainage for schools. These reveal, amongst other facts, that the peak flow of the day was found to be in the early afternoon and was attributable primarily to kitchen washing up and cleaning. With such a large flow it was considered that traditional gradients could well be slackened, and, particularly from the main outfall pipe from the last connecting manhole, or the point of connection from the kitchen, falls, on restricted sites, up to 1 in 120 for a 6 in. pipe are permitted.

Again, in school design, or in any class of building with long runs of drains, with few connections, pitch-fibre pipes offer considerable capital economies, plus the advantages of very rapid laying and of enabling drains to be laid and tested and the trenches back-filled the same day. Unfortunately, the cost of junctions and fittings in pitch-fibre, which are still at an early stage of development, is prohibitively expensive. Using a combination of pitch-fibre for long runs and stoneware for branches and fittings, at least a 5 per cent saving can be achieved in the drainage costs of a typical school.

Refuse Disposal. This is a service which, as a result of the inability of municipalities generally to spend more money on it, and of the failure of architects and engineers to produce a better but more economic alternative, is a disgrace. The dry chute system in blocks of flats, and dustbins in high-density terrace housing, with once-weekly dust-cart collection, are really unworthy of the standards of design, and hygiene, and engineering skill which go into all other aspects of residential building. A few progressive authorities have adopted the water-borne Garchey system for multi-storey flats, at an additional capital cost of the order of £80 a dwelling (1*s*. 9*d*. per week at present interest rates), but what the saving is in terms of dust-cart collection I do not know. Perhaps members may have some evidence on this. I have no doubt, however, that a water-borne system, at present, does constitute a greater charge. The point is for how many years hence are we to go on with the dust-cart system: what work is going on and how as architects can we help to develop cheaper but more hygienic methods of converting household refuse into waste, for disposal simply through the ordinary drains or by other means?

Architect–Engineer Collaboration

Neither architect nor engineer really knows sufficient about the problems of installation and maintenance, or about the performance of the services in buildings, particularly in regard to taking advantage rapidly of the latest developments in science. The situation is made worse by our failure most of the time to achieve good design-stage collaboration.

[2] 'Report of the Joint Committee on Field Research into Drainage Problems,' May 1954, sponsored by the Institution of Sanitary Engineers (now the Institution of Public Health Engineers), the B.R.S., the Institute of Plumbers and the Sanitary Inspectors' Association, obtainable from the Institution of Public Health Engineers.

Instance after instance has been quoted to me, in relation to the work of the best London consultants' offices, where at design stage the consultant has had only the haziest notion of the space to be occupied by the services, of the depths and widths of ventilation trunking, of the sizes of pipes, or of radiant panels, or how much space the various services will occupy at bends, crossing over each other or passing from a hollow floor space to a vertical duct. I quote from one such instance. 'The consultant first said, when asked, that 2 in. clear depth below beams was quite enough—so I allowed him 6 in. When detailing had proceeded some way this was proved insufficient and he asked for 8 in. as an absolute limit—so I allowed him 12 in. The final chapters have still to be written.'

Again, mechanical and electrical engineers seem to find it extraordinarily difficult to understand the problems of architecture and building. As a friend of mine said recently after a bitter experience: 'Detailing, as the architect understands it, is not in the consultant's vocabulary.' Most consultant services are largely covered by $\frac{1}{8}$ in. scale diagrammatic drawings up to contract stage, and thereafter by subcontractors' drawings or by working things out on the site. All too often, in spite of the utmost pressure by the architect, large-scale details are never prepared, and work goes on from hand to mouth—'verbal drawings.'

Undoubtedly there are extraordinarily few good consultants in these fields. On the other hand if the architect goes direct to a specialist firm he accepts, on behalf of his client, responsibility for the validity of a great deal of work which he may not be qualified to check, and he also loses the advantage of competitive pricing. Large authorities, or private offices, employing their own works service engineers are in the best position to achieve design-stage collaboration, but even here difficulties arise.

Part of the problem is that mechanical and electrical engineers generally are trained within professions which cover much wider industries than building, and their main possibilities of advancement within their professions lie outside the building industry. Again, although the services may in total amount to 25 per cent of the cost of a building, each separate installation in itself is 'chicken-feed' compared with the installations in the engineering, shipbuilding, power and other heavy industries. On the other hand architects and structural engineers have generally no great difficulty in talking the same language, and there are every day examples of successful collaboration between them.

These problems, it seems to me, are of sufficient importance not only to the economy and durability of building, but to architecture itself, to justify a conference or even an ad hoc committee between representatives of the R.I.B.A. and of other professions. Short term, the problems cover the details of collaboration, the preparation of schemes and working details. Long term, they cover the education and training of architects and engineers, particularly in the integration of services into the design of buildings, and the building up of better appreciation of each other's point of view. They also include the need for co-operation between engineers and architects in extending the scientific testing of materials and in undertaking field trials to establish better criteria for design. The scientific collation and interpretation of maintenance records also required joint action in a field in which research has hardly begun.

We are past the stage when through sheer ignorance of materials and the performance of services we need to drape buildings, like battleships, with accessible pipes everywhere. On the other hand we are far from achieving the same confidence in the design, finance and durability of the services that we customarily display towards the other elements of building.

J. C. EASTWICK-FIELD, B.A. [*A*]

Finishes

THE TITLE of this Conference includes the word 'design' and so I make no excuse for writing about the appearance of finishes as well as their durability and cost. In the present context I have taken the word 'finish' to mean stone and brick and concrete and glass as well as floors and paints and plasters: and I have concentrated on materials used externally, leaving those used inside for the Conference discussions: for I think it more important to consider whether buildings shall be ephemeral with glittering facades, or grow old with grace, or be 'as ugly as sin but quite indestructible' or just plain shoddy—than to decide on one kind of floor finish rather than another.

I have begun by discussing in Part I the background against which we make our choice of facing materials—a choice which inevitably affects the future maintenance of the building: and in Part II I discuss some problems of maintenance.

My examples are London buildings because I know them best.

Part I—The Background

A Change in Sense of Values

Of the years 1815–30, Summerson[1] writes:—

'Now, as to the motives for building and the sources of the necessary funds. The State was easily and by far the greatest initiator of building in London after Waterloo; so great a proportion of public wealth can rarely have been spent on architecture in the capital in such a short time . . . it was George IV's superb breadth of view, his intolerance of projects of less than regal scale, that fortified the initiative of others and lent propriety to extravagance.'

How delightful a prospect!

Today the State is still our most important patron, but conditions are very different: compare this injunction from a local authority—it has been 'reluctantly accepted that it may be necessary for architects to consider the use of adequate but less desirable materials, reducing capital cost at the expense of future maintenance.'

Even in private practice, much time is spent on work which is part of some large programme, involving national expenditure, and the democratic committees through which this expenditure is administered are primarily, and not without reason, more interested in obtaining the greatest amount of accommodation for the least possible cost than they are in the aesthetic quality of the buildings; though there are, of course, some notable exceptions. What is odd is that hardly any of them pay heed to any but *first* costs.

The Tradition of Facing Materials

Historically the most cogent argument for using one material rather than another —and the choice was in any event limited—was that it was obtainable *locally*. It was therefore also in all probability relatively *cheap*. Availability and cheapness have, broadly speaking, always been predominant factors except when flights of fancy or extravagance permitted otherwise; but for the most part the behaviour of such materials as were used was known from experience to be good and their colour and texture to be appropriate to our climate and our temperament. There remained only to decide questions of detail, the surface treatment of a stone, the colour and texture of a brick, the pattern of tile or slate hanging, the colour of timber weatherboarding. If these materials were correctly used it was expected that they would remain serviceable for at least 100 years, and this accorded with the tacit assumption that all buildings should last as long as possible. Timber was, of course, soon disposed of by dry rot and beetle if it was not protected from them, but suffered less when used as a facing: only plaster, pebbledash and roughcast were commonly claimed by the ravages of time, and then more often than not because of settlement or structural failure.

There is all the evidence necessary to convince us of the excellence of the traditional materials this country has built with—even of mud—but they have not always remained unchallenged: and in view of the present use that is made of many new materials in new ways it is interesting to consider why, and what became of the alternatives.

Wood suffered an eclipse after the Great Fire because it *burned* too readily, but has always sought to regain a place both as a structural material and for cladding: at the moment it is much in fashion. At the beginning of the 19th century stone was beginning to be too expensive and gave way in many cities to stucco which being cheaper was used in imitation of it: but no thought was given to the recurring cost of painting it. It is fortunate for us today that some thought *was* given to first costs, and that no more than the fronts of many houses of that date were stuccoed. Stucco came and went as a fashion, a fake—and at the present high cost of painting we shall

not wait long for a new fashion for removing it!

In the mid-19th century a great interest was shown in polychromy and its expression through terracotta and faience. An impetus was given to terracotta by stonemasons' strikes in 1877, but on the whole these materials were chosen deliberately for their *aesthetic* quality. Impervious facing materials like faience have continued to fascinate architects from time to time, and of a house in Kensington, No. 8 Addison Road, built by Halsey Ricardo for Sir Ernest Debenham in 1906–7, Pevsner[2] says it 'is the architect's boldest profession of faith in the use of imperishable glazed materials and colour in the modern street.'

Ricardo's faith has, however, never so far become universal and although there are many buildings faced with terracotta and faience they always give us a slight aesthetic jolt. As a nation we have preferred brick and stone and paint. Yet it is precisely imperishable coloured materials that most intrigue us now, especially for use in curtain walls, and it remains to be seen whether they will become a permanent part of our vocabulary. In these days of easy transport the advantages of 'local' availability no longer apply and they, like other materials which are now used throughout the country, will not be ruled out on that account.

Bearing in mind some examples of permanently coloured materials which have already been put on the market, I would like to quote a sentiment expressed by the late H. M. Fletcher.[3] He writes, also about No. 8 Addison Road, which he knew well: 'this brings me to a generality which I am convinced is true, though it is opposed to the belief and still more to the desires of most English people, that dark skies require a sober colour scheme. White if you will, yes—white is never amiss, but brilliant positive colours in the open air need a brilliant positive light to bring them together. H. Ricardo's house in Addison Road is a courageous attempt, done with conviction and therefore to be honoured, but a city of such houses in our climate would be distressing.'

You may or you may not agree about brilliant colours, but if they are to be bright they certainly should not be discordant and we should not in our exuberance allow them to run wild.

This brings me to comment, too, on what I think to be an unfortunate and I am sure expensive habit of using a heterogeneous collection of materials on the same building. I hope that in some of the new and welcome criticisms which are appearing in the Press we will be reminded amongst other things that there is virtue in simplicity, and that to design beautifully it is not necessary always to use a great variety of materials on the same building and—to borrow a metaphor again from the late H. M. Fletcher[4]—to 'display them and crowd them like medals across the chest of our buildings'; as if we were afraid of losing the opportunity of showing our virtuosity. Pevsner alludes to a rather different manifestation of this unnecessary complication on the faces of buildings in his reference to 'the current craze for surface patterning to hide uniformity of plan'.[5]

Facing Materials and the Life of Buildings

The B.S. Code of Practice on Durability[6] divides buildings into the following four classes:

1. Monumental, designed to have a life of at least 250 years.
2. Permanent, designed to have a life of at least 100 years.
3. Semi-permanent, designed to have a life of at least 25 years.
4. Temporary, designed to have a life of at least 10 years.

The implication is that the materials of which they are built last only as long as the allotted life of the buildings, but in fact buildings fall into disuse rather because of social obsolescence or because they outlive their earning power, than because their materials decay: even temporary buildings are often distinguishable only because the kinds of material used on them become *shabby* more quickly and not because they decay more quickly. The classification 'temporary' could, in fact, more appropriately relate to whether or not the building could be taken down and re-erected elsewhere.

If we look at the buildings produced even in the last half-century we see that in nearly all of them materials are used which will outlive the theoretical anticipated life of the buildings. On balance, the majority are of brick or stone which it is known can last indefinitely. It is only quite recently that we have witnessed large numbers of buildings each with a totally different complexion; built with materials and techniques of which we have little experience and which may be short-lived.

There were, of course, early adventurous buildings where glass was used for the first time as a facing material and faience was reintroduced because it was hoped it would overcome the dirt and grime which disfigured the traditional materials. Concrete with exposed aggregate was used in Chiswick bridge; Crabtree, Slater and Moberley gave us the first curtain wall at Peter Jones' store (1936), and stainless steel was used on the Daily Express building (1935), in Fleet Street, and on W. S. Crawford's offices (1929) in Holborn. Experiments were made in the 'new style' by a few architects using exposed monolithic concrete, and their designs were copied by speculative builders using smooth, dense renderings, with the dire results we know only too well and which have done so much harm to the ideas they were intended to express, but except for these last the actual durability of the materials was never seriously in question, though the amount of maintenance they might require was unknown. Can this be said of the new designs: the framed, the prefabricated and the standardised buildings into which or over which we fix natural and synthetic materials of all sorts, slate, tiles, faience, mosaic, rendering, timber, artificial and natural stones, glass, concrete, metals, and plastic, and not least, of course, a variety of 'curtain' walls with many kinds of 'made up' infilling panels? The consequences are anything but certain.

Prefabrication and Dry Construction

Despite this profusion of materials and methods, brick is still more widely used as a facing than any other material, but in one important respect it has been challenged. In the early 'thirties Gropius wrote:[7] '*Dry assembly offers the best prospects because* (to take only one of its advantages) moisture in one form or another is the principal obstacle to economy in masonry or brick construction (mortar joints). Moisture is the direct cause of most of the weaknesses of the old methods of building. . . . The outstanding concomitant advantages of rationalised construction are superior economy and an enhanced standard of living.'

I think we believe more than ever in the ultimate success of systems of dry construction, though they are as yet far from having economic advantages and we are only just beginning to find any solution to the problems of their finish and of keeping out the weather. It is because of this belief that we continue to experiment with prefabrication and standardisation and the production of self-finished materials, avoiding site labour; it is the justification for their present expense and for the risks attached to them—and for curtain walling, which represents one aspect of dry factory-made building.

I wrote to Professor Gropius to ask him what he thought now of these remarks and you may like to see part of his reply.

'For a long time I have been convinced that prefabrication is not a revolution, but a slow evolution. In this country (America), surprisingly enough, this evolution has been forthcoming more for high rise buildings—skyscrapers—than for small domestic buildings. A building like the Lever Brothers office in New York is constructed about 85 per cent of manufactured parts, which at the site are only assembled. For houses the mistake has been made to try to repeat one type of house in its totality infinite times. But since man will always rebel against over-mechanisation, this approach in my opinion is wrong. The component parts of houses are to be manufactured and be assembled to different-looking units. If one opens Sweet's Catalog in this country, showing what is on the market of prefabricated parts, one recognises that prefabrication has penetrated already very far into the field of building.

'I am of a different opinion than you are regarding England. I have found that very substantial progress has been made in prefabrication in your country, particularly in school buildings. Everybody respects what has been achieved there in a steady improvement. . . .

'After considerable experience in the field of prefabrication I have come to the conclusion that the difficulties still to be overcome are less technical than financial. . . .'

Here is plenty of encouragement, but we cannot afford to hoodwink our clients.

The temptation to use unknown materials at their expense and without their concurrence must be resisted. It is said that when asked what had happened to an extensive scheme for mass-producing standard prefabricated houses, the architect-designer replied that it was like a lot of operations, the operation had been thoroughly successful but the patient had unfortunately died. That may be all very well for the architect but not so for the client, especially when he has to pay excessively for the experiment. The R.I.B.A. is now spending greatly increased sums of money publicising the technical competence of the profession and it is important that we should live up to the claims that are made. Clients may often encourage experiment, but when they are committed to new materials and techniques they will have the right to know at least if there will be additional maintenance, and how much.

Maintenance is not, of course, confined by any means to 'dry construction', as the notes which follow in Part II show, but it is with these systems of construction that the extent of unforeseen troubles *may* be catastrophic, and it is the materials used in them and other relatively new external facing materials that claim most attention. First, however, I would like to refer to scientific research and to the extent of technical knowledge required by architects.

Materials and Technical Knowledge

We read, once again, in Summerson's *Georgian London* that soon after 1763 the 'professional gentleman-artist-architect' arrived. The contribution of the gentleman-artist-architect has of course been magnificent, but his existence under present conditions, when technological development has brought to building as to other spheres of activity so many new materials, and new uses for old ones, is anachronistic, unless he can also be more scientifically minded and have more technical knowledge than is implied in such a person. Would he, for instance, understand the full import of such phenomena as the 'output per man month in square feet'?

More seriously, it is no longer always possible nor desirable to use only those materials which from long experience are known to satisfy, but if new ones are to be used the risk of failure must be reduced as far as possible. To do this we must accustom ourselves to new criteria for judging them, and learn to apply what scientific knowledge there is of them. For example, it is now known that the durability of stone —admittedly a traditional material—depends largely on the *kind* of pores and on the *proportion* of pores of different sizes which are contained in it, and this knowledge was put to use selecting the Clipsham stone for the repair of the Houses of Parliament.[8] The discovery was, of course, made easier by the fact that certain stones were known from observation to have lasted and others to have failed, and deductions could thus be made from the study of each. It is not so easy to find equivalent scientific criteria for assessing the behaviour of new materials, but some initial guidance can be given from the results of accelerated laboratory tests which are designed to simulate conditions in use.

I am not suggesting for one moment that architects should become scientists: but that they will have to become more receptive to technical data and demand much more exact information from manufacturers, many of whom can quite well afford to—and often do—have at their disposal the means of research. Neither do I suggest that scientific knowledge will absolve architects from looking at buildings and from the need to develop the faculty of personal observation. A faculty which is needed more than ever in these days of advertising, of persuasive salesmanship and small fascinating samples!

Part II—Maintenance

It is comforting to learn from a large firm of managing agents that 'experience shows that properties designed by Architects require less expenditure or upkeep than the remainder. By the remainder we mean, of course, buildings of a speculative type . . . where a building has not been designed by an architect, then it is our experience that over and above exterior and interior redecoration, replacement of boilers, repairs to lifts, etc., one frequently has to face the expenditure necessitated by poor quality building, e.g. settlement, bulging walls and disintegration of materials.'

Nevertheless, I think we must admit that even buildings designed by architects require some maintenance to prevent deterioration of the fabric and to keep up appearances, and this involves:—

(A) The repair of defects due to bad detailing or to the unsuitable choice of materials or to failure of the structure or to misuse by the user, all of which are avoidable.

(B) The renewal from time to time of materials which are known to be relatively impermanent; in particular, parts subject to wear such as floor finishes; also pointing of masonry; and, above all, paintwork. These are legitimate in so far as their cost is a recognised and anticipated expenditure, but the degree of expenditure is very much in the hands of the architect both in respect of his overall design and of his choice of individual materials.

(C) The cleaning of the building inside and out.

A. Maintenance resulting from Bad Detailing and Unsuitable Choice of Materials

1. The Effect of Natural Elements. Arkell, in his book *Oxford Stone*,[9] says of true coral rag: 'If subsequent generations of builders had been content with this cheapest and most abundant of materials, the University and Colleges might have been saved *hundreds and thousands of pounds*, the only cost of upkeep being occasional repointing and renewal of decayed freestone dressings.' This is a reminder that for some kinds of buildings at least we must think of maintenance in the distant future as well as of immediate maintenance. He also refers to large sums spent on repairs because of *rusted cramps in the stonework* of the University Museum and Christchurch Meadow Buildings. Today if we use stone at all we use thin slabs, and we can seldom afford bronze cramps which we know to be durable, and it is pertinent to ask how we are to know the life of the galvanised iron cramps which are commonly used.

Ignorance of scientific knowledge, even though it is available, often leads to the *juxtaposition of materials* which affect each other adversely, particularly in the presence of moisture: for example, limestone should not be used together with sandstone; cedar with metals, particular zinc; copper or brass with rubber; lead paint with aluminium, and aluminium with lime mortar.

Sand and flint lime bricks are in common use as facings, being competitive in price with clay bricks, and their behaviour in such buildings as Powell and Moya's flats at Pimlico suggest that they stand up well and retain their good but somewhat mechanical appearance in city atmospheres, when properly used. Nevertheless, they are the kind of material which, being similar in size and shape but not in behaviour, to a more familiar material (in this instance, the clay brick) is likely to lead to heavy repair bills if misused. As you all know, I expect, flint and sand lime bricks have a high moisture movement, and we have recently been warned by the Building Research Station of the awful results of disregarding the advice given in Digest No. 6 (Revised).

As Womersley has said, we are all interested in concrete as a facing material. In my view *prefabricated panels of concrete* with *exposed* aggregate offer the nearest alternative to brickwork in terms of initial cost, good weathering and low maintenance provided they are designed with adequate cover to the reinforcement. Like all materials with a cement matrix they move considerably with changes in moisture and temperature and, since they are usually of fairly large dimensions, joints between them should allow for movement. It has been found that better results requiring less maintenance are obtained if the joints are dry than if they are pointed in mortar or mastic. The Airey houses, where slabs were fixed in a similar manner to weatherboarding, are interesting examples of this technique.

Fairfaced concrete is quite another matter. Womersley has already said that good quality exposed reinforced concrete with reasonable cover to the steel will endure without maintenance in most atmospheres. In a report on its durability, we read, 'In future, the spalling face of a modern reinforced concrete building should be regarded as a disgrace to owner, engineer and contractor alike'[10]—not to mention the architect! But this does not take account of appearance. In cooling towers and other structures of similar magnitude, the effect of shape and scale outweighs the uneven and dingy weathering of the material: it is

tolerable in narrow beams and columns, but otherwise in my opinion it requires a clean atmosphere and strong sunlight to give it character. Bush hammering is expensive and patterning of the surface from the shutter has been surprisingly little used.

If one is looking for examples of materials chosen deliberately because of low initial cost which have subsequently required excessive maintenance or complete renewal within an unjustifiably short time, I think that the extensive use made of *mild steel in railings* with only paint protection is the most striking. We have not fully appreciated that mild steel does not behave as well as cast iron or wrought iron, which we say we could not afford even if the genuine puddled bar were available. Because galvanising or zinc spraying makes just that extra cost, whilst not contributing obviously to the initial appearance, it has too often been thought not worth while. Rusty iron railings are a horrible indictment of false economy.

With more justification we are experimenting with other metals, without having any exact knowledge of what will happen to them. I have in mind *aluminium alloys* for which there are various kinds of treatment, designed either to provide an exposed surface resistant to oxidisation, or to give a suitable base for paint. Now if the latter are used—as they are being used in panels with large surface areas—without paint, I think there is a considerable risk that in appearance at least they may prove disappointing and eventually need paint to make them acceptable.

Experience of some kinds of glass panel and some ways of using *glass as a facing in 'curtain walling'* is such as to warrant my including the material in the category 'unsuitable', though I must hasten to add that this applies only to certain kinds of glass in certain circumstances. In a number of buildings the panels have cracked: to such an extent that one architect was prompted to admit that although his client was not put to any additional expense because the manufacturer, being a reputable one, replaced the panels free of charge, he nevertheless became rather tired of having no wall! It was not surprising, for in this instance some 300 panels broke. It is an interesting phenomenon and scientists have been posed a nice problem by the breakages. They have been quick to discover that they are due to stresses in the glass caused by differences in the temperatures accumulated in the centre of the panel from those at the protected edges: also that, for reasons which are too elaborate to dwell on here, the breakages have not been so prevalent when the panels have been framed in wood as they have been when framed in metal. Two firms who have been foremost in developing coloured glass panels have recently withdrawn the *wired* panels which they originally put on the market because it was found that the wire contributed to the likelihood of breakage, as did the rough edges of the panels. The point in mentioning this in some detail here is to emphasise the risk which we take in using materials in an unfamiliar way and of the responsibility of manufacturers to make exhaustive tests before marketing their products.

The periodic withdrawal of proprietary products when they prove to be unsatisfactory emphasise some of the special difficulties in maintenance which may arise from new methods of building. For example, there is an endeavour being made by a number of firms to produce composite glass panels with decorative patterns incorporated in them, but one cannot help wondering to what extent these same patterns will be available in twenty years' time when one or two panels need replacing —or what the cost will be in having them specially reproduced.

In order to maintain the good appearance of buildings the facing materials must either attain a pleasing patina or they must be capable of being cleaned easily. Cleaning has not in the past been recognised as a regular and acceptable item of external maintenance, and such materials as *exposed concrete, cast artificial stone and asbestos* have been used with the intention that they shall receive no further treatment. I have already commented on concrete, but I feel it worth while emphasising that we must not delude ourselves by its appearance when newly cast and must be prepared for our clients to become progressively dissatisfied with it and eventually to wish to paint it. Moreover, that when they come to this decision they will not find it easy to obtain suitable paints, and that great care in choice has to be made if flaking is to be avoided. This applies equally to asbestos cement which is often used on balcony fronts and other similar details—the very elements on which reliance is placed to give emphasis of tone or colour. Efforts have occasionally been made to improve the weathering qualities of concrete at considerable extra expense by covering it with proprietary renderings, but the effect has not been at all convincing.

Cast artificial stone is to be seen everywhere: often crazed, streaked, and dead in appearance. Samples of paint have recently appeared on Wells Coates' block of flats in Palace Gate, Kensington, built in 1934, which suggest that the owners are thinking of painting it. Yet here, I think, the cast stone panels have weathered extremely well, perhaps because the whole building is faced with them, without projections, and I feel that if they were washed from time to time, which would be less expensive than painting, they would continue to give satisfactory service. The moral is, I think, that cast stone demands a particular kind of detailing, and that since a good deal of research has been devoted to the material, we should obtain the best advice on its composition before lightly deciding upon it.

2. The effect of Human Elements. Materials have inherent characteristics which make them resistant to weather and suitable to different atmospheres. It is a prerequisite that they should have these characteristics, but they also have to withstand the treatment they receive at our own hands, and it is obviously uneconomical to ignore what the user of the building may do to them. Around the bases of buildings, at entrances and on corners one must pay due regard to the damage and defacement caused by the accumulation of dirt, by kicking, by leaning bicycles and by the wiles of children. Sometimes the damage is accidental, sometimes wilful. Glass at low level is broken, rendering is scored, tiles are chipped. In one building, to my knowledge, aluminium window sills are at this moment being taken out and replaced in another material because they are soft enough for children to pull them about. Much depends on where you build and what kind of persons are to use the building.

B. The Legitimate Renewal of Materials

It is self-evident that not all the materials in any building last as long as each other. There is not yet any coded practice for relating the life of component parts one to another or to the life of the whole building. An attempt was made when the B.S. Code of Practice on *Durability* was written, and a framework was produced as shown in Table I, with the intention that grades would be accorded to materials in the general series codes. But this has obviously not proved practicable!

The main conclusion we can draw from the figures is that interior and exterior decoration, which we may assume to mean paintwork used either for appearance or for protection or both, is bound to constitute a very large part of the burden of maintenance because it requires frequent renewal throughout the life of any building. Perhaps it is not surprising when we discover that 'exterior coatings are exposed to all the components of the natural climate as well as to the destructive impurities contributed to the atmosphere by man. The deteriorative agencies, interior and exterior, may be summed up to consist of extremes of temperature, moisture, sunlight and reactive gaseous elements of the atmosphere (oxygen, ozone, sulphur dioxide, hydrogen sulphide); marine exposure (salt spray); abrasive materials (sand, dust and dirt carried by winds and water); and biological agents such as fungi, bacteria, insects and marine organisms. As corollaries, there should be added strong chemical agents or solvents which attack a coating, and undesirable characteristics of the surface which is coated (porous, acid, alkaline, oily, or resinous in nature)'![11]

One can also see from the table that there are other component parts which it is assumed will require replacement because they wear out; gutters and downpipes are, in fact, an example, but by comparison with paintwork they last a long time in relation to the life of the building.

The expenditure by the M.O.W. in a typical year on all aspects of maintenance of buildings in their charge is £13½ million. Builders' maintenance, including cleaning, amounts to £8½ million, of which £2 million is spent on repainting.

The Eastern Region of the British Rail-

TABLE I

Minimum **Satisfactory Life of Component Parts of a Building**

Component parts of building	Grade	Minimum satisfactory life (years)
Internal (non-structural) walls and partitions ..	A B	100 10
Roof coverings	A B C	100 20 5
Interior wall and ceiling finishes	A B C	50 20 5
Floor finishes		*
Exterior finishes	A B C	100 20 5
Interior decoration	A B C	10 5 2
Exterior decoration	A B	4 2

* The minimum life which can be required for a floor finish is so dependent upon the wear conditions and occupancy that a general classification cannot be given.

ways spends a total of £1,500,000 on general building maintenance, of which £350,000 is accounted for by painting, that is about one-fifth.

When Wilkins designed St. George's Hospital at Hyde Park Corner in 1827 and faced it with stucco, he will not have foreseen that by 1957 it would be costing its owners an average of £1,500 annually to keep the outside in good decorative repair.

In the Report of the Committee of Enquiry into the cost of House Maintenance[12] we find the table below.

From this table we note that painting accounts for about twice the cost of any other item of maintenance, and that the index for the increase in cost of materials between 1939 and 1953 is higher for those associated with decoration than with any other trade except carpenter and joiner.

The figures are a clear indication of the expense of continual repainting, and it is not surprising that some local authorities responsible for housing disallow colour-washed exterior finishes even if, when applied to cheap bricks, they show a saving in first costs over a facing brick. But we are thus denied the means of continuing a tradition which has given us many delightful buildings.

The total cost of painting during the life of any building will quite obviously depend on how much of it needs painting and on how often it is repainted. In practice, the variation in both is striking; on the one hand one must assume that architects are sometimes unmindful of the future obligations to which they commit their clients by including large areas requiring painting, and on the other hand one may question whether there is any logic in the widely differing periods customarily adopted between painting. To show the variation in cost due to the amount of painting to be done, I quote average costs given to me for exterior redecorations over the past seven years related to the number of flats at various properties:—

Pinner	48 flats.	£14 0*s.* 0*d.* per flat
Muswell Hill ..	27 flats.	£4 0*s.* 0*d.* per flat
Kensington ..	87 flats.	£8 0*s.* 0*d.* per flat
Shepherds Bush	70 flats.	£5 0*s.* 0*d.* per flat
Brighton:		
Astra House ..	61 flats.	£8 5*s.* 0*d.* per flat
Brighton ..	123 flats.	£27 0*s.* 0*d.* per flat
(Here the whole of the exterior walls also had to be painted.)		
Hove	31 flats.	£16 0*s.* 0*d.* per flat

To show the variation in the periods between painting, I quote figures collected by J. Stillman in 1952 from a number of authorities responsible for the redecoration of schools:—

County	*Internally*	*Externally*
North Riding of Yorkshire	5 years	4 years
Surrey	8 years	4 years
Middlesex	8 years	4 years
Hertfordshire ..	7 years	5 years
L.C.C.	6 years distemper 12 years paintwork (washed after 6 years)	6 years

Leases normally require exterior decorations to be carried out every three years and interior decorations every five or seven years, whereas recent advice given to the owners of a building with monolithic reinforced concrete walls built in London in 1937 and now painted with a synthetic resin high gloss paint is that it should be *washed down* every two years and repainted every four years externally.

If one assumes that it is desirable to cut down the cost of painting, one must ask

Table showing **Typical Sub-division of House Maintenance Costs in 1939 and 1953**

Trade group	1939 sub-division of cost				1953 indices (1939 = 100)		1953 sub-division of cost			
	Labour (including on-costs)	Materials	Total labour and materials cost	Trade totals as percentage of total cost	Labour	Materials	Labour (including on-costs)	Materials	Total labour and materials cost	Trade totals as percentage of total cost
(1)	(2) £	(3) £	(4) £	(5) per cent	(6)	(7)	(8) £	(9) £	(10) £	(11)
Painter, decorator and paperhanger ..	31·4	11·6	**43**	43	318	**300**	99·8	34·8	**134·6***	42·6
Plumber, gasfitter and smith	16·4	7·6	24	24	318	290	52·1	22·0	74·1	23·5
General labourer, bricklayer, paviour, roofer, plasterer and fencer	13·2	3·8	17	17	318	260	42·0	9·9	51·9	16·4
Carpenter and joiner ..	10·5	3·5	14	14	318	460	33·4	16·1	49·5	15·7
Electrician	1·5	0·5	2	2	318	250	4·7	1·2	5·9	1·8
Total	£73	£27	£100	100	318	311 316	£232	£84	£316	100
Percentage of Total Cost	73	27	100				73·4	26·6	100	

* At May 1957 this figure would be equivalent to £150·8.

how it can be done and what the effect of doing so will be.

Ignoring the possibility of cheaper paint, one can either hope for paint that lasts longer or one can choose materials which do not require painting. The second course may well result in a loss of sparkle, even of the 'collar and cuffs effect', which is so delightful a feature of many brick-built terraces: and to have no paint would give no opportunity for individual choice or for variation of colour during the life of a building.

I imagine it is unlikely that there will be any startling improvement in durability of paint, but since cement paint is reputed to last as long as oil paint in such places as it is appropriate, it would seem to offer considerable savings. Comparative costs for redecoration in oil and cement paints, including average preparation, are:—

Two coats oil paint	5*s*. 8*d*. yd. super
Two coats cement paint . .	1*s*. 9*d*. yd. super
Scaffold for each	4*s*. yd. super

Stove enamelling, which has been tried on metal windows, for instance, and on some curtain wall panels, can only give a longer initial life and eventually needs repainting.

If, on the other hand, painting is to be avoided, one may wish to consider materials in which a colour is permanently introduced, or where natural colour is acceptable, and the comments which follow are on some of the more obvious examples.

Self-coloured Renderings. We have all probably been tempted to use these in order to satisfy our aesthetic desire for a white—or even a blue—building without having to obtain the effect in paint. They can be successful in clean atmospheres, when dark colours which fade are avoided, and if they are carefully applied in not too large areas. But what is all right in the country may not be at all right in a dirty town; and in both the run-off from sills will too easily make disfiguring streaks unless the details are carefully thought out. I have not been to Stockholm, which is in any case a clean city, but Mitchell has referred to the drabness of some of the older coloured renderings there.

Timber Boarding. Western Red Cedar and a number of hardwoods—Afrormosia, Idigbo, Iroko, Makore, Meranti and Teak are naturally resistant to decay and can all be used without protection, but they will all change in colour to a silver grey, and except for Western Red Cedar, may suffer some surface checking. In practice they are usually oiled, but the only value of oiling them is to preserve the colour. The oil requires reapplication every six months to be of any real use—and even so it collects dirt.

Varnish and other clear finishes used outside undoubtedly add lustre, but it is a mistaken idea to suppose that they are an economic alternative to paint. Oliver of the T.D.A. showed at a recent paper[13] given at the R.I.B.A. that samples of many kinds of clear finish, with one exception, broke down after twelve months, and that the best resistance was obtained with a phenol formaldehyde resin-based varnish. He claimed that it is very doubtful if even the best finish will last over three years, even under conditions of average exposure. Further, once the surface has broken down clear finishes are more difficult to renew than paint—whose 'chalking' provides a good base for future coats.

Bronze, Aluminium and Hardwood Windows. The bronze mullions in the curtain wall that envelops Peter Jones were treated with a special cellulose and only after eleven years without maintenance was the treatment renewed, when the base metal was found still to be in excellent condition, but by today's standards bronze is a luxury we can rarely afford. Occasionally, owners are still prepared to exceed the normal bounds of expenditure to obtain exceptionally high standards of finish which will not require maintenance. Recently the sum of £10,000 was spent out of a total cost of £45,000 for curtain walling on a building at Northfleet, Kent, in order to have dull polished stainless steel pressings to cover the skeleton members of the walling. Aluminium, which would have been cheaper in *mill finish*, was considered as an alternative, but it was known that it would require maintenance to keep it bright and that there was likelihood of heavy corrosion owing to the proximity of a cement works. It is interesting to note that in order to obtain a *polished* surface in aluminium, which would also have required maintenance, a further £7,750 would have been required over the cost of the stainless steel. It does seem important to realise that although the corrosion of aluminium is not serious like the rusting of steel, the metal does not remain in its pristine state without constant cleaning—at least in city atmospheres. One recent advertisement says of aluminium windows, 'There is a heartening NIL against maintenance'. But this is, of course, true only if one is prepared for them to oxidise and go black with dirt. At one public building 'maintenance free' aluminium costs over £1,000 annually to keep clean, as much, in fact, as the cost of cleaning the glass; and the mullions of the T.U.C. offices in London are showing spots of oxidisation before the building has been completed.

Anodising delays the formation of the *natural* oxide film and makes it more regular, but needless to say it puts the cost up. The extra on a figure of, say, £52 11*s*. 3*d*. for five windows in mill finish would be £7 17*s*. 6*d*., showing an increase of about 15 per cent.

Before leaving the subject of metal windows, I must refer to the resistance to corrosion which has been shown by unpainted galvanised steel windows. If one considers their appearance acceptable, and they prove to have the life that experience of them in some of the sea coast forts would indicate, they would save much maintenance. They are at present being tried for this reason by British Railways.

We must all have wondered at some time or other whether hardwood windows would not really be more economical than painted softwood. Tender figures for the windows in a factory/office block were recently obtained for comparison, the sections being exactly the same for hardwood and softwood, and they are quoted below:—

Softwood (primed and painted two undercoats and one finishing coat)	£2,441 13*s*. 0*d*.
Hardwood (oiled):	
Agba	£2,073 6*s*. 0*d*.
African Mahogany . .	£2,192 7*s*. 6*d*.
Teak	£2,875 13*s*. 6*d*.

It would seem that hardwood can sometimes be cheaper in *first* cost than painted softwood, but the more usual experience is that whilst it is initially more expensive, one is left wondering, other things being equal, whether the saving on maintenance would justify the extra. Here is a hypothetical example:—

A window 2 ft. × 3 ft. in 2 in. moulded sash in 1 square:

6 ft. super at 8*s*. 5*d*. ft. su. for *hardwood* (oak)		= 50*s*. 6*d*.
6 ft. super at 2*s*. 8*d*. ft. su. for *softwood*	= 16*s*.	
1st painting (inside and outside) at 8*s*. (including preliminaries and overheads)	= 8*s*.	
1st, 2nd, 3rd and 4th repainting at 6*s*. 8*d*. (prepare and paint two coats)	= 26*s*. 8*d*.	
		50*s*. 8*d*.

Assuming an interval of five years between painting, the cost of the softwood window will have exceeded that of the hardwood in 20 years. In view of the decreasing value of money, and therefore of the probable higher costs in maintenance as the years progress, it might in fact take less time to do so. The usual objection to untreated hardwood is that it goes grey, but this is not always a disadvantage and, to cite but one example, the greyed teak windows in Gilbey's offices in Camden Town, designed by Chermayeff and built in 1937, to my mind look excellent.

Permanently Self-coloured Materials and Panels. It is always disturbing to know that on average an ordinary steel sash in a brick cavity wall, with glazing, painting, lintol and inside and outside sills, and sealing of the cavity costs 10*s*. to 15*s*. ft. super *extra* over an equivalent area of the cavity wall. Furthermore, that as compared with cavity brick walling with 20 per cent window area at 9*s*. ft. super of window and walling, various kinds of 'curtain walling', each with similar infilling panels, may cost 30*s*. when of stainless steel, 19*s*. when of painted mild steel, 15*s*. when of hardwood, and 13*s*. when of softwood. If on top of the extra capital cost for this kind of construction our clients are committed to frequent re-painting of the *panels* incorporated in the system, we may well incur their displeasure.

Ignoring insulation, the cost of some plain panels are:—

1. Pre-galvanised steel sheet	..	3*s.* sq. ft.
2. Coloured glass	.. from	3*s.* 4*d.* sq. ft.
	to	6*s.* sq. ft.
3. *Vitreous* enamelled steel	..	10*s.* sq. ft.

The first requires painting, the second is an obvious choice, though colours from one manufacturer are restricted to about 16 (others produce a very much wider range) and, despite the steps which have been taken to overcome them, breakages may still occur, and the third is promising if only the cost could be reduced and the difficulties of waviness and distortion overcome. We have experience of vitreous enamelled signs, such as those of Stephens inks, which are in excellent condition after half a century—provided always they have not been damaged by being hit: and here lies the difficulty with vitreous enamelled gutters and downpipes which otherwise seem to save maintenance. Coloured anodising of aluminium, which is an attractive idea, has yet to be proved to have any real permanence.

Concrete and Steel. It is perhaps unfortunate, judging by the appearance of many of them, that concrete lamp posts cost less to maintain than cast-iron and steel ones! One is confronted with a similar problem of maintenance when deciding whether to have painted steel or unpainted reinforced concrete structure in stores, Dutch barns, and light industrial buildings. Steel is usually the cheaper of the two, but where labour is scarce or there is difficulty of access the complete freedom from maintenance offered by reinforced concrete is an argument in its favour which many building owners accept.

C. Cleaning

1. Washing. Owing in part to our cities being more grimy than they used to be, and in part to the discovery that washing is not harmful to stone and brick, as it had been supposed, it has now become a familiar sight to see monumental and commercial buildings having a regular scrub! In fact in Paris, I am told, there is a law which demands that important public buildings shall be washed once a year, and in England some firms have regular four- or five-yearly contracts.

This interest in washing, together with the necessity for regular cleaning of the brightly coloured and polished surfaces that are now fashionable, must be reckoned with financially and practically. So far it has been rare for there to be a suitable outside supply of water (bursts from connections made inside add to maintenance difficulties!) or for provision to be made for cradles from which the work can be done, and in busy cities where it is most inconvenient, scaffolding is constantly being put up and taken down at great cost.

The cleaning of a large building is expensive: a typical multi-storey stone-faced building might cost over £1,000. Washing limestone (sandstones are more difficult to clean and may cost up to three times as much, just as old encrusted stonework is more expensive) costs about 9*s.* yd. super, of which scaffolding accounts for no less than 4*s.* yd. If cradles are used instead of scaffolding their hire and erection cost about 1*s.* 3*d.* yd.; but if cradle fixings and track were provided a further reduction in the charge could be made. It would seem to be well worth while to provide fixings in view of the fact that in industrial cities the frequency of cleaning is likely to be at about five-year intervals for stone and brick buildings. Polished granite is comparatively easy to clean and is not considered to need a 'face lift' more often than every 20 years; but since the material costs initially £4 ft. super one would expect some compensation!

The Building Research Station is conducting investigations into the long-term durability of a number of selected buildings put up in the last 20–30 years and in their reports have shown that the difficulty of access has often led to damage which might otherwise have been discovered, and to the omission of redecoration because of the high cost involved of erecting scaffolding. If the means of reaching the building were made easier there would obviously be a saving not only on washing but also on painting and on incidental repairs.

The particular work being done by the Building Research Station to which I have referred is, in my opinion, of very great interest and importance and the results ought to be made known as soon as possible.

2. Window Cleaning. Charges for window cleaning are assessed for each building individually and are governed not only by the area but also by the difficulties and the risks involved in doing the work. Window cleaning can involve large expenditure and in buildings such as the Festival Hall costs over £1,000 annually. School windows are usually cleaned once a term, but glass curtain-walled buildings may need cleaning six times a year.

It is the view of the window cleaning companies and, I believe, of the authorities concerned with the legal implications, that architects and window designers will need in future to be more conscious of the window cleaner's lot and to try to make it easier and safer and incidentally, therefore, cheaper.

I think the problems of window cleaning affect the design of a building and the cost of its upkeep enough to make it worth while quoting the answers to some questions I asked a leading firm of window cleaners:—

1. To what height is it practicable to clean from ladders and what is required to lean the ladders against?

A reasonable height is 25–30 ft., although it is possible to work up to 45–50 ft. There are many disadvantages to this method. Often it is necessary to have one man 'footing' the ladder; three- or four-part ladders require special operatives—and this increases cost. Strong winds are a danger. Ladders must be at a certain angle commensurate with height and difficulty is experienced through the ladders causing an obstruction on the footpath or roadway.*

A firm surface is necessary for the ladder to rest against. With curtain walls there is a great risk of glass being broken as the ladder is difficult to control at that height. Architects and occupiers do not always favour the use of ladders because after a few cleans the face of the building is scored where the latter slides up and down.

2. Do the standard extended hinge casements really make it possible to clean from inside or not?

This type of hinge is not as simple as it may at first appear. In the majority of cases the reveal does not allow sufficient gap for a man's arm and after cleaning three or four windows his forearm is badly scratched.† Frequently the fanlight or fixed portion of this type of window necessitates the man having to stand outside.

3. Is it of great advantage to be able to clean from inside in, say, a tall office building, or if, for instance, the building is curtain walled, requiring cleaning all over, is it more economical to clean from cradles?

Cleaning cost is often reduced when it is possible to clean from inside; but usually the space required for the man to perform his duties is too valuable; furniture has to be shifted, or if it is not moved there is a risk of accidents.

When cleaning curtain walls from inside the man generally has to stand on the frame and reach as far as possible to clean the fixed portion, and most transoms are not strong enough or large enough to accommodate him.

The vitrolite or other materials under windows must be cleaned by cradle or bosun's chair. The majority of customers do not require these to be cleaned as frequently as the clear glass. It would be as well if architects became more conscious of the desirability of fixing cradle runners to the roofs of their buildings.

4. What factors make it possible to clean from inside and what are the limiting dimensions beyond which the cleaner cannot reach?

This depends mainly on a man's physique. The area of glass he can clean from the inside of a building with complete safety is very small, unless an inward opening or horizontally pivoted (Swedish type) window is fitted, and many of the latter do not come far enough over. He is unlikely to be able to exert enough pressure beyond about 2 ft. 6 in.

5. Are there regulations governing any aspect of window cleaning?

L.C.C. Bye-laws and individual firms' own rules. L.C.C. Bye-laws insist on the cleaner using a rope and belt at any height exceeding 6 ft. over a public highway, but there is rarely anything for him to fix the rope to. Safety eye bolts should always be

* *Ladders used for window cleaning are, I know, a hazard to passengers at London Airport.*

† *On the same subject another cleaner expressed the view that architects' forearms were thinner than window cleaners'!*

Type of finish	Initial cost. per sq. yd.	Ministry of Works			Factories Act, 1937		
		Frequency		Maintenance cost per sq. yd. per annum	Frequency		Maintenance cost per sq. yd. per annum
		Redecoration	Wash		Redecoration	Wash	
		Years	Years		Years	Months	
Oil paint	5*s*. 6*d*. (primer and 3 coats)	8	3 and 6	6¼*d*. (2 coats)	7 years	14	10*d*.
Emulsion paint	2*s*. 1½*d*. (2 coats)	8	3 and 6	5¼*d*. (2 coats)	7 years	14	9*d*.
Washable distemper	1*s*. 3*d*. (2 coats)	4	Nil	4½*d*. (2 coats)	14 months	Nil	1*s*. 3½*d*.
Limewhite	7*d*. (1 coat)	4	Nil	2½*d*. (1 coat)	14 months	Nil	8½*d*.

fitted. There is a growing anxiety about the danger to cleaners and more insistence is being placed on the regulations. American bye-laws demand safety fittings and they are, in fact, provided in the form of a stud on each window to which the cleaner can fix his rope and belt.

Internal Finishes

If at this stage an excuse is needed for saying almost nothing about internal finishes, it is that 'the bore is the man who says everything'. During the time that I have been thinking about this paper I have, however, been struck by quite incidental and unrelated items which seemed to me to be of interest and likely to provoke discussion.

1. That in the Hospital for Sick Children in Great Ormond Street it was felt worth while in the interests of hygiene and economy of cleaning to lay all the floors on the ground floor in the new out-patients' department, which are in terrazzo, to falls, and to provide piped water outlets at suitable intervals near floor level in order to be able to flood the floors and thus to make their cleaning less arduous. It is easy to accept the idea now the floors are there, but it must have been a difficult decision to make when designing the building.

2. That one building owner thought it financially an economic proposition to spend £30,000 on installing a clean air plant in a building in an industrial city, costing £200,000, thus reducing cleaning costs (which may normally be reckoned at 1*s*. 6*d*. to 2*s*. per sq. ft. floor area per year), and increasing the rental by making the accommodation more attractive.

3. That, in interior maintenance, as in external maintenance, one of the main items of expenditure is decoration, and that the capital and maintenance costs of painting with various materials and frequencies have been set out by the M.O.W. as shown above.

4. That modern interiors in light colours, though they show the dirt more obviously, nevertheless encourage cleanliness, and justify the elimination of dark brown dadoes; but that there is no guarantee that carefully worked out levels of illumination calculated perhaps to satisfy some regulation, and relying on the reflective value of a particular colour, will be retained when the time comes for redecoration. If particular colour relationships are of importance in a design then we ought to let our clients know how to re-order the colours, and it would help if the kinds of material were recorded since some do not like having others put on top of them later!

5. That there is much to be said in favour of using linoleum and of plastic cloth as wall finishes. There are linoleum dadoes 20 years old and still in good order: and it is the experience of British Railways that plastic cloth which can be scrubbed without damage is proving satisfactory, even in public halls and other places subject to heavy wear and to deliberate vandalism.

6. That the modern alternatives to plaster for wall and ceiling linings are mostly prefabricated panels, often designed to give heat insulation and sound absorption, but unfortunately adding to the difficulty of cleaning, increasing sound transmission and frequently adding to the danger of fire. With Members of Parliament trying to introduce legislation compelling factory owners to increase the heat insulation to save fuel it will be up to the manufacturers to produce durable fire-resisting insulating materials at an appropriate price.

7. That since plaster is still the cheapest finish, we retain an interest in its improvement. Everyone complains about modern hard plasters—and one grows tired of having to tell one's clients at the end of the maintenance period that they will have to put up with small cracks until the next decoration, because to cut them out and make good cannot be disguised without redecoration, which the builder cannot be asked to do free of charge.

8. That it is no good trying to imitate modern Italian interiors, leaving out the time-honoured traditional details such as skirtings and architraves and rounded corners, unless dirt is eliminated and plaster abandoned in favour of marble!

Acknowledgments

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Overseas Tour of the President and Secretary R.I.B.A.: Diary—III

Wellington, New Zealand (26 April.)

[*The last instalment of the Diary broke off after describing a call made on the Rt. Hon. Walter Nash.*]

Mr. Cross and Mr. Spragg then went to Lowry Bay to the home of Mr. Gray Young [*F*], where he and Mrs. Young had arranged a tea party in their honour, attended by many Wellington architects and other leading professional men and their ladies. There was even an iced cake suitably inscribed with the names of the President and Secretary of the R.I.B.A. Later Mr. Calder and Mr. Dawson took the two visitors to the ferry E.T.V. *Hinemoa* where, in Mr. Muston's company, they embarked on the night voyage to Lyttelton, the port for Christchurch.

Christchurch. (28 April.)

On landing at Lyttelton Mr. Clifford Wells [*A*], the Chairman of the Canterbury District Branch of N.Z.I.A., drove Mr.

Cross and Mr. Spragg to Christchurch to Warners Hotel. They attended morning service at Christchurch Cathedral, the original plans for which were made by Mr. (later Sir) Gilbert Scott in 1858; it was an inspiring service and they were impressed by the excellence of the music and the stimulating address given by the Dean. After the service they had the pleasure of meeting the Bishop and the Dean.

In the afternoon Mr. Wells called for the two visitors and took them for a drive to Port Hills, where they met a number of members of the Canterbury District Branch and their wives and famifies. In the evening Mr. George Griffiths [*A*] called for Mr. Cross and Mr. Spragg and in the course of a drive round the city they stopped at the Canterbury District Branch's atelier and spoke to three students who were working on their testimonies of study, an example of keenness at 9.30 p.m. on a Sunday evening. Then at Mr. Griffiths' house they met a few of the Christchurch architects and discussed professional and educational matters.

29 April. The day started with another Press interview and photographs. Accompanied by Mr. Wells the two visitors then called on the Mayor, who gave them a warm welcome and showed them over the Council Chamber and Municipal Offices, but, strange to relate, this important city of Christchurch has no Town Hall. Mr. George Griffiths then showed Mr. Cross and Mr. Spragg some of the interesting buildings in the city, including the Old Provincial Council Chambers and the Centennial Baths, as well as some new workshops and office buildings for the NAC at the airport, for which he is responsible.

Mr. John Collins [*A*] and Mr. Percy Leonard entertained the visitors to lunch at the Canterbury Club and then Mr. Wells took them to the new Cashmere School, designed by the Government Architect, where they were shown over by the headmaster, Mr. T. H. Coombs, who was Minister of Education in the last Government. Before returning to the city they had a quick look at the new hospital buildings at Cashmere. Then followed a broadcast recording by Mr. Cross, Mr. Muston and Mr. Spragg. Several members of the Canterbury District Branch joined the two visitors for dinner, after which they went to the Four Ships Restaurant, where a meeting and supper in their honour was attended by a large number of members and their wives. Coloured slides were displayed showing some of the buildings and superb scenery in the South Island; an amusing commentary was given by Mr. Ray Taylor [*A*], the lantern being operated by Mr. John Hendry, Vice-Chairman of the Branch. Speeches of welcome were made by Mr. Wells and Mr. Muston, and a handsome album of photographs of the recent work of members of the Branch was presented to Mr. Cross as a gift to the R.I.B.A. Mr. Cross and Mr. Spragg addressed the meeting and expressed their thanks. Mr. George Hart [*L*] was present and was delighted to meet the President of the R.I.B.A., as he had worked in the office of Mr. Cross's father over fifty years ago.

30 April. Mr. Clifford Wells drove Mr. Cross and Mr. Spragg to Timaru, on the first part of their journey to Dunedin. A slight deviation from the route was made to see an interesting little church and library at Tai-pau, by the late Cecil Wood. Some of the Timaru architects were met at lunch and afterwards Mr. R. Heaney drove Mr. Cross and Mr. Spragg on the final stage of their journey to Dunedin. The journey was broken at Omaru, which seemed to be a brisk and lively little town with some fine examples of classical architecture. A stop was also made to see a most attractive little church at Maheno, by the late R. S. D. Harman. Mr. Cross and Mr. Spragg reached Dunedin at 7 p.m. and later went out to the house of Mr. Angus Black [*A*], Chairman of the Otago Branch of N.Z.I.A., where they met several members of the R.I.B.A. for a most useful talk and were entertained to supper by Mr. and Mrs. Black. More reporters and press photographers were awaiting their arrival at Dunedin.

Dunedin. (1 May.)

The day started with another Press interview and photographs and afterwards Mr. Black and Mr. E. J. McCoy [*A*] took Mr. Cross and Mr. Spragg for a drive round the city and showed them some of the interesting buildings, including a delightful modern house which won for Mr. McCoy the N.Z.I.A. bronze medal. In the afternoon Mr. Cross, Mr. Muston and Mr. Spragg made a broadcast recording and also recorded on a tape machine for future use by the N.Z.I.A. Then a formal call was made on the Mayor, Sir Leonard Wright, at the Town Hall, where he presented the two visitors with autographed copies of a book *The Story of Early Dunedin*. In the evening Mr. Cross and Mr. Spragg were the guests of the Otago Branch at dinner, at which some twenty members were present. Mr. Black presided and welcomed the guests, and speeches were made by Mr. Cross, Mr. Spragg and Mr. Muston, followed by informal questions and answers.

2 May. Mr. McCallum, Vice-Chairman of the Otago Branch, called for Mr. Cross and Mr. Spragg and drove them to the airport. Mr. Muston flew with them to Wellington. He had proved a delightful travelling companion on the tour through New Zealand. On arrival at Auckland Mr. Tony Curtis [*A*] was waiting and drove the two visitors into the city by a picturesque route. In the evening Mr. Curtis took them to his house, where they had the opportunity of meeting other Auckland architects.

3 May. This was the longest day in the lives of Mr. Cross and Mr. Spragg, as on the way to San Francisco they passed the International Date Line, and so it was two days in one. Mr. Cross began the day with a recording for broadcasting, followed by a Press interview. Mr. Curtis then drove the two visitors to the airport. Owing to defective engine trouble in the aircraft, departure was delayed for over an hour. Mr. Cross and Mr. Spragg were concerned at this as representative members of the R.I.B.A. working in Fiji had arranged to meet them at Naudi and they disliked the idea of keeping them waiting as they had come all the way from Suva, a car journey of 150 miles. The representatives were Mr. D. R. Steele [*A*], Government Architect, Mr. S. J. McMullon [*A*], Assistant Government Architect, and Mr. Gordon Larsen [*A*], an architect in private practice. Local problems and the proposal to form an architectural society in Fiji were discussed.

Mr. Cross and Mr. Spragg boarded their aeroplane about 10 p.m. and flew through the night on the long journey to Honolulu, which they reached about 10.30 a.m., still on 3 May. During the flight the Equator was crossed, but without ceremony. On getting off the plane all the passengers had garlands of hibiscus placed round their necks. After checking of passports and going through Customs, for they were now in U.S. territory, Mr. Cross and Mr. Spragg were driven in high-powered cars to their hotel, some distance from the airport, passing the famous Pearl Harbour on the way. In the afternoon the two visitors had a short drive and saw many fine modern buildings. In the evening they began the next part of their flight, on the same aircraft.

San Francisco. (4 May.)

San Francisco was reached soon after 7 a.m. Mr. Cross and Mr. Spragg were taken in a bus to the Air Terminal Buildings in the city along fine highways, many of them carrying eight lines of traffic with cloverleafs and cross-overs at various points. They stayed at the Fairmont Hotel and in the afternoon were guests at a cocktail party given by the North California Chapter of the American Institute of Architects at the offices of Messrs. Campbell Wong. Mr. Worley Wong is Hon. Secretary of the Chapter. The two visitors were welcomed by Mr. William Stephen Allen, President of the Chapter, and there were some ten or more members of the Chapter present with their wives. Mr. Spragg was particularly pleased to meet again some of those who had welcomed him on his previous visit to San Francisco in 1952, particularly Mr. and Mrs. Wendell Spackman and Mr. and Mrs. Charles Pope. In the evening Mr. Cross and Mr. Spragg were the guests of the Chapter at a dinner party in a pleasant restaurant in the Chinese quarter, the President, Vice-President, Hon. Secretary and a number of members of the Board of Directors being the hosts.

5 May. In the morning Mr. Charles Pope took Mr. Cross and Mr. Spragg for a drive during which they saw the Civic Centre, including the famous City Hall, and the Opera House in which the United Nations came into being, a recent Catholic church (Corpus Christi) by Mario Campi, and a new high school at Daly, in course of construction, also by Campi, without any daylight to the classrooms. The well-known shop by Frank Lloyd Wright, and many

other interesting buildings, were also seen. After they had looked at the magnificent Golden Gate bridge, Mr. Pope drove the two visitors over the San Francisco–Oakland Bay bridge, 8¼ miles long, into Oakland, where they were the guests of Mr. and Mrs. Wendell Spackman for lunch at the Sea Wolf restaurant on the water's edge. Afterwards Mr. Cross and Mr. Spragg saw the Oakland exhibition of gardens and homes, and then Mr. and Mrs. Spackman showed them the campus and some of the buildings of Berkeley University, which is part of the University of California. After entertaining the visitors at their charming house, Mr. Spackman drove them back to San Francisco.

Vancouver. (6 May.)

The flight from San Francisco was good, and at the Vancouver airport Mr. Cross and Mr. Spragg were met by Mr. J. Lovatt Davies [*A*], Immediate Past-President of the Architectural Institute of British Columbia, who drove them to the Hotel Vancouver. Later, he and Mrs. Davies took the two visitors for a drive through Stanley Park and then entertained them to dinner on the top floor of the Sylvia Hotel, where they had wonderful views of the city.

7 May. After checking the reservations for the various flights through Canada and the U.S.A. Mr. Cross and Mr. Spragg lunched with Mr. Clive Campbell, Deputy Minister of Public Works and President of the A.I.B.C., Mr. J. Lovatt Davies and Mr. Peter Thornton [*A*], Past Presidents, and Mr. Kenneth Sandbrook [*F*] at a restaurant in Stanley Park. Afterwards Mr. Sandbrook took them to the University of British Columbia, where they met Professor Fred Lasserre, Head of the School of Architecture, and saw some of the work of the school. Then Mr. Cross and Mr. Spragg were the guests of honour at a party arranged by the A.I.B.C. at the Georgia Hotel. This was attended by a number of members, including some from Vancouver Island. Then, at a dinner with the Council of the A.I.B.C., Mr. Campbell, who presided, welcomed Mr. Cross and Mr. Spragg, and Mr. Cross gave a short address, after which there was an informal discussion on points of mutual interest. The two visitors stayed for the Council meeting as observers. The meeting finished shortly after midnight.

8 May. Mr. J. Lovatt Davies took Mr. Cross and Mr. Spragg for a drive over the suspension bridge and over a new road which, when completed, will be a magnificent highway to Horseshoe Bay. Then through beautiful scenery back to the Vancouver Club for lunch as guests of Mr. Peter Thornton, after which the visitors looked at Mr. Thornton's office and talked to several members of his staff, some of whom had recently come from England.

Owing to an engine defect on the plane, departure from Vancouver was delayed for five hours and Mr. Cross and Mr. Spragg did not reach Edmonton until 11.30 p.m., where they were met by Mr. Howard Bouey and Mr. J. P. Bell, President and Hon. Secretary respectively of the Alberta Association of Architects. The lateness of arrival prevented Mr. Cross and Mr. Spragg from attending a reception which had been arranged to enable them to meet members of the Association.

Edmonton. (9 May.)

The day started with an interview with representatives of the Press and broadcasting companies, after which—accompanied by Mr. Bouey and Mr. Bell—Mr. Cross and Mr. Spragg visited the City Hall and were received by the Deputy Mayor and one of the three City Commissioners. The Hall, only recently completed, was designed by Dewar, Stevenson and Stanley. The two visitors were then the guests at lunch of members of the Council of the Alberta Association, and afterwards visited the Provincial Jubilee Auditorium where they were shown round by Mr. Ronald Clark of the Alberta Public Works Department. Mr. Bouey then drove them round the University; they also saw some of the recently built industrial and oil refinery buildings.

In the evening Mr. Cross and Mr. Spragg were the guests of the Association at a reception and dinner at the Corona Hotel. It was attended by a large number of members of the Association. Speeches were made by Mr. Bouey, Mr. Cross, Mr. Spragg and Mr. Bell. It was particularly interesting to meet Professor C. S. Burgess [*F*], who became a member of the R.I.B.A. over sixty years ago. He was trained in the office of Sir George Washington Browne in Edinburgh and his first job in London was with 'Bungalow Briggs'.

(*To be continued.*)

The Constructional Use of Timber: Report of the Discussion

The papers read at the Symposium were printed in the June JOURNAL. The Discussion which followed was opened by Hilton Wright [*A*]. Thomas Mitchell, M.B.E., B.Sc., A.M.I.Struct.E. [*A*], was in the Chair.

Mr. Hilton Wright [*A*]: When John Stillman asked me to say a few words to open this discussion I felt a little chary of doing so because I am not really qualified to talk about timber at all, or at least only as a practising architect. Now that I have seen Mr. Oliver's slides of what happens to the timber I have used, I feel even less happy about it.

However, I should like to say one or two words about how I view the use of timber as a constructional material. John Stillman has mentioned some of the reasons which would lead an architect to choose timber rather than concrete or steel; but there are one or two rather special reasons that have led me to employ timber structurally on the majority of school buildings which I have designed.

The first of these is perhaps rather uncomplimentary to the steel and concrete firms, who have done so much work on producing various special systems of construction. But the schools I have designed have been small ones for private clients and not for local authorities. It has been my feeling that if you are working rather on your own it is better to employ a material which you can control yourself to a very large extent and which the contractor can buy without having to go to a large and powerful sub-contractor.

That applies particularly to steel which, apart from being in short supply, is very much controlled where it is used for special systems.

That is one reason, and I think it is an important one, because nothing is more frustrating than to have worked out a scheme based on someone's system which you have learnt at great pains and then to find you have the site slab there and three or four months' wait until you can start to build something on top of it.

The second reason is even more specialised, and that is that the first school I had to design was by the seaside. When I went to the site, I passed many houses built between the wars which had been fitted out with steel-frame windows. I saw what happened to them by the seaside. There again the window manufacturers will say that their windows are now protected. But I have a slightly uneasy feeling, all the same, about using steel or any ferrous metal near the coast.

Concrete also, I think, is rather too liable to failure in a sea atmosphere. The slightest little bit of steel that does not happen to be properly covered by concrete can mar a very large area of wall.

Rapidity of construction is a strong argument for choosing steel or concrete where you can ensure that the units arrive when you want them; but it has been my experience that the rapidity of construction with these methods is really hardly any greater than with timber, assuming an equal starting date, particularly where the labour available is not experienced in the use of a particular system.

Another point which argues strongly for the use of timber in school buildings is the window wall. Unless you are going to use steel windows—or should I say—if you are going to use timber windows, and many people have a preference for them—I think you will find with the single-storey building that the mullions that are needed to give stability to the window frames themselves

are almost always sufficient in strength to carry the roof.

Added to that, with a timber mullion, if it is slightly shaped, you do from inside the room get that pleasing gradation of light on the side of the mullion between the outside and the inside which is often very much lacking in a steel window with a steel box frame.

Lastly, perhaps the most compelling reason of all is that timber to me is a sympathetic material, one with which one has worked oneself, knows how to shape, and —in spite of what Mr. Oliver has shown—has some idea of how it will react to treatment. I have not these same feelings about steel or concrete.

Those are the main points I wanted to make, but there is one point that was brought up in Mr. Barr's paper which is very important. It has not received enough notice yet in the technical press in this country. This is the business of the vapour barrier plus the use of a separate protective paper behind timber outside cladding. I have to confess that it was not until I had to build a house for a Harwell chemist and his Canadian wife, who informed me about Canadian practice, that I realised that these two factors were so important. I felt very small about it until I started ringing up manufacturers and asking them if they could provide me with a water-repellent building paper which was also a breathing paper. I tried a great many firms before I found one a long way up in Scotland that could produce such a paper. And this firm could produce it only because the man to whom I spoke had been to Canada and understood what I wanted.

If any of the speakers have time to touch on this topic again, I should be grateful. I should be very interested also to hear whether the L.C.C. have found any difficulties over this business of the vapour barrier in combination with the use of a breathing paper.*

Mr. W. A. Allen [*A*]: One thing which seemed to me to be missing from Mr. Oliver's very interesting paper was any reference to the fact that sharp arrises always reduce the thickness of the paint film over them, and this is where failure very often begins. If we could get an absolutely standard practice on easing all arrises on exterior timber work, we might reduce the rate of repainting by a year or perhaps two in ordinary building work, and if such an effect were achieved, it would represent several million pounds.

Secondly, following Mr. Hilton Wright, it has been a mystery to me as a Canadian working over here for twenty years why we cannot find this 'darn' building paper. It seems almost essential for timber building work; it is the thing you put between the hardwood floor finish and the softwood base to avoid squeaking, and between the finish and the rough cladding of the external sheathing. It used to cost almost nothing in Canada, but it seems to cost the earth here—if and when you can get it.

* Readers are referred to a note by Mr. Cleeve Barr on page 325 in the June JOURNAL.—Ed.

Mr. A. W. Cleeve Barr [*A*]: I will go back to the L.C.C. tomorrow and have scientific tests made on all the building papers we are now using. I must admit that I have taken a good deal on trust in this respect. I do not know myself the extent to which various building papers, one would expect to be breathing papers, are in fact breathing papers.

Mr. A. C. Oliver: It is general experience that the sharp edges should be eliminated if possible.

The Chairman: We will throw the building paper back to the Building Research Station.

Mr. W. A. Allen [*A*]: Ah, that is very sharp practice, Mr. Chairman! (Laughter.)

Mr. Philip Reece (Timber Development Association): I have agreed with so much that I can find little to say except to challenge one of Mr. Barr's statements. He said solid floors were cheaper, warmer and something else I have forgotten, but if I had remembered it I should have challenged it.

I should like to suggest, and to ask whether he agrees, that the solid floor is cheaper if it is on a fairly flat site and if you are building enough houses to have a specialist to lay the surface covering at a fairly economical rate.

I think it is only warmer if you have stable conditions of heating, central heating, to a standard you might get in big blocks of flats but are quite unlikely to get in most low-cost houses.

With intermittent heating in a normal council house, although the Building Research Station might prove that, on fuel consumption, there is a saving, I do not think you can prove that it is actually warmer. It would *feel* colder, and as you are building a human environment rather than a heat accumulator that is what is important.

I am sorry I cannot challenge the third statement as I omitted to make a note of what it was.

The Chairman: I am quite sure Mr. Barr will be able to answer that quite well. I should not join in this discussion, but I seem to have spent a lot of time saying how to get rid of draughts from the floor.

Mr. A. W. Cleeve Barr [*A*]: Cheaper, warmer and better from the point of view of avoiding maintenance troubles. I had in mind dry-rot. It is a matter of individual experience, this question of cheapness, and time will tell. I think timber suspended ground floors are definitely going out. If I wanted a wood finish on a ground floor I would lay it over a concrete sub-floor.

As to warmth, again it is over to the Building Research Station. They have published something on this,[1] and I personally think that from the point of view of scientific fact, heat loss and so on, generally they are right. A timber floor to be free of trouble has to be ventilated. If it is ventilated the thermal insulation is destroyed. If additional thermal insulation is provided there is again the problem of breathing and allowing ventilation round the timber floor, apart from the extra cost, and the whole matter can become very complicated.

[1] *Thermal Insulation of Buildings*, Nash, Comrie and Broughton D.S.I.R., pp. 22–3.

On a steeply sloping site I would agree that a timber floor has economy to offer over a concrete one.

The Chairman: That puts it quite well. The Timber Development Association cannot grumble. They have had a pretty good boost for timber already. Let the hollow timber floor go at that!

Mr. George Fairweather [*F*]: I am sorry but I should not like this little point to go to rest yet. It is a very important factor in the use of timber. I think, too, that we shall have to reopen the whole question of thermal insulation, particularly in the light of what the previous speaker said about intermittent heating as the means by which most of the English get their comfort at home.

I do believe that a serious crime has almost been committed in the present generation by the change-over, such as has taken place in recent years, from timber for the construction of floors and roofs to steel and concrete without comparable—or if you like—supplementary provision for the purpose of suitable insulation.

We hear a great deal about insulation against overall heat loss through our structures, but we do not hear nearly enough about comfort response in our provision of heating. There is no point in talking about heat loss when there is no heat to lose, and that is a fairly general condition in our buildings.

There is no point, either, in talking about heat loss if you are not going to think about the heat you are going to give to your structure first before your insulation is of any effect.

We know there has been some trouble in London about damp flats. I do not know whether it is the right place to mention such a thing, but I fear this is the place where we should take this point up. And I would like to stress what I consider an important benefit of timber by saying you would not have these damp flats if you used more of it.

I am not suggesting we should switch back to timber for construction in our flats, but we should insulate better. We have to kill this misconception about thermal insulation. Our insulation technique designed against overall heat loss is not the insulation we require for heat comfort at all.

Mr. G. Cleveland Edgett (British Columbia Lumber Manufacturers' Association): If I might make one remark about the timber floor, I was recently involved in a house at Olympia. It was gratifying to hear the public comment on the suspended wood floor and even more to have one of the largest manufacturers of thermoplastic tile comment that there was a great public demand for the return of the suspended wood floor and that they were intrigued with the use of the timber and plywood

underneath the tiles. It would seem on that basis that the suspended wood floor is a long way from going out.

Mr. W. E. Tatton Brown [*A*]: Two points do not seem to have been stressed sufficiently. The first is very elementary—the ease of fixing to timber. Ceiling panels can be fixed so much more easily to timber beams than if any other system of construction is used.

The second point is the accuracy of large timber beams, and I wonder whether Mr. Hemmings would give us some figures. I was associated with him on the production of some of the beams he illustrated, and we found they were remarkably accurate. We made, after some experience with other systems of construction, considerable allowance in our fixing brackets with oval holes to allow for movements of the bolts so that we could make adjustments and get ample tolerances. But in almost every case it was an infernal nuisance having the oval holes and was quite unnecessary.

Could Mr. Hemmings say anything about the accuracy which he is accustomed to produce with timber beams?

Mr. R. M. Hemmings: Dealing with craftsmen you naturally expect accuracy. If you lower the standard of your product down to a semi-skilled job, you must sometimes expect inaccuracy. The obvious solution is to adopt the same attitude as the engineer. He satisfies himself that he has established standards in manufacture so that these discrepancies are obviated.

It all ties up with the site organisation, the shop organisation, and with the breaking down of operations so as to eliminate as far as possible anyone not knowing what he is doing and why he is doing it. It is one of the troubles one is continually up against with the changing personnel in the trade today.

Mr. Tatton Brown mentioned the four or five schools on which we worked together. Recently I did another school, and with changing personnel I did experience a lot of difficulty in getting the accuracy that is so essential to quick erection and simplification.

I have made the point about ease of assembly in my paper, the quickness with which the structure can be erected so that there is an umbrella over the whole site, giving a covered space for the remainder of the materials.

The Chairman: Can you tell us anything factual about tolerances?

Mr. R. M. Hemmings: I should not like to commit myself, because of shrinkage and swelling of timber; but I try to maintain accuracy. With an 80 ft. building any wood panels should follow the grid line, and if you work on centre lines all the way through there is no reason at all why the wood panels and the frames should not come out at 80 ft. and not 80 ft. $2\frac{1}{2}$ in., upsetting all the grid.

Mr. R. T. Walters [*A*]: It is, I think, fairly common practice among manufacturers or designers of building systems, besides the overall size of a panel, carefully to arrange a small gap between the panel and the next one to make sure they will erect properly. That gap is $\frac{1}{8}$ to $\frac{1}{16}$ in. and dimensionally the panel on the drawing to the dead size you want it is made $+0$ and $-\frac{1}{16}$. It bears out Mr. Hemmings' point that you can make quite large panels to a high degree of accuracy. The point of the $+0$ is that it is more serious in putting up a large line of wall to have a lot of panels that are oversize than to have panels that are undersize.

Mr. G. B. Crow (Beves & Co. Ltd., Shoreham-by-Sea): I declare my interest in the timber trade. May I take up a point made by Mr. Oliver in recommending the choice of timbers for exterior use? It is suggested that among other qualities one should seek to avoid knots. If trees had no knots they would have no branches and the leaves of the trees would not have grown. I suggest that we should accept knots as one of the facts of life and only be a bit selective but not exclude them.

There is nothing wrong with a knot that is sound, ingrown and not of excessive size. Too much of a fetish is made of trying to use wood without knots. If they are sound and ingrown they are no real difficulty, and they are often a real gain to the appearance.

Could the Panel tell me why a small house should only be 18,000 ft. cube? The point of the question is the reference made by Mr. Barr to the special easements applied for the use of timber as long as the house is over 10 ft. from the boundary. As soon as you get over 18,000 ft. grid you come to another class up to 36,000 ft. grid. What are the facts that justify selecting 18,000 ft.? I have never been able to hear of them, but I suppose someone must have pulled the idea out of his head and put it down on paper.

In prefabricated systems, especially with the use of timber, one of the difficulties of manufacturers—and Mr. Hemmings may have something to say about this—is the way bills of quantities are prepared. They follow traditional or agreed lines, but they are not necessarily adapted to good pricing of modern designs of joints and assemblies. I would have thought that there was scope for a revision of quantity surveyors' practice to give an estimator a better picture of what he is trying to price for.

Lastly, Mr. Barr mentioned that as a vapour barrier the aluminium-foil lining of plaster board might be suitable for this country. I do not like that word 'might'. For a vapour barrier you want something that is either going to keep the vapour in or not. I do not think there should be any doubt about it. No doubt a polythene sheet would do it, but if one can obtain plaster board with this foil on it and get certain results, that is a very good solution. I should like to ask whether he has deliberately been half-hearted or just does not want to overstate his case.

The Chairman: I am pretty sure we have no one on the platform who can tell you about the bye-law question. I will pass the question to Mr. Barr and ask him to deal with the aluminium foil.

Mr. A. W. Cleeve Barr [*A*]: In regard to vapour barriers, I agree that if one wanted to be 100 per cent sure—and a lot depends on the type of house and the standard of heating—one would use something like polythene sheeting.

A similar problem arises with a panel faced with wired glass or any form of metal sheet, behind which is a cavity and a plasterboard lining, with a room on the inside which might suffer a high degree of humidity. I have had experience of many panels of that kind, where I have not ventilated the cavity behind the wired glass and have relied on aluminium-foil backed plaster board as a vapour barrier. No trouble has so far occurred. I have had panels removed after one or two years for inspection to ascertain the extent of any traces of condensation. While one cannot be 100 per cent sure, I am coming to the conclusion, admittedly as a result of only limited experience, that in the conditions prevailing in this country, foil-backed plaster board, given good workmanship, provides a reasonable vapour-barrier.

The Chairman: On bills of quantities I am sure many of you could express an opinion, but I was asked to refer the question to Mr. Hemmings and we will refer knots to him as well. On knots in certain European countries there is legislation or regulations on the subject. In some countries, knots of particular categories are required to be pushed out or drilled out, timber plugs being inserted.

Mr. R. M. Hemmings: May I say right away that in certain hardwoods knots to me are a joy.

Last year I was investigating the strength of timber in Finland and for over five years they have made elaborate tests of knots and have produced a very fine schedule. But for laminated work certain timbers that come within the middle third and others that are purely backing, like the dead wood one gets in the hull of a ship that carry no stresses or strains, there is nothing wrong with them, provided they are not dead. I do not think one should look askance at timber because it has knots in it, especially in decorative woods. What a joy knotted pine is to the decorator and interior designer! No, let us be frank about knots. We have to live with them.

The bill of quantities for the roof I showed you at Hammersmith took me a week to price. It was a £15,000 contract by the time I had finished with it. I would not attempt to price any job like that without drawings or a knowledge of the job.

Those who were at the last Symposium heard a lot of discussion about bills of quantities and the way they are taken out. It is a professional's job and some surveyors I have met have taken it very seriously and are most meticulous in their description and elaboration. But to ask any estimator to price a bill of quantities without drawings

is leaving too much to the imagination, and it is not fair to the client.

The Chairman: Mr. Crow's point about knots was directed at Mr. Oliver, and he was dealing with surface finishes. One of the points is that the surface finish won't last as long on the knots, but we will hear from him about that.

Mr. A. C. Oliver: I would agree that over a knot the finish does not last as long. Also, finish is decorative, and presumably one does not like knots. One has only to look round this room. I do not see any anywhere.

Mr. R. M. Hemmings: May I come back on that? You may not find many knots because this is mostly veneer. There is very little solid wood.

Mr. W. A. Allen [*A*]: I was very interested in Germany last year to come across the use of a tough, red-coloured waxed paper for floors in cheap housing, to protect the floor from plaster droppings, cigarettes, water and all sorts of oddments. Everyone knows the mess floors get into in houses. I was very much struck by their protection of the wood, yet it was not specially good wood.

It has occurred to me, and probably to the polythene makers, that here is a job for polythene which could be stapled down to floors and would probably be much cheaper than cleaning them afterwards. It would at least reduce cleaning costs if a reasonable finish was wanted.

I should like to add one note on a practice I have used myself for some considerable time, working over concrete floors with floor heating in housing. Ten years ago I started using $\frac{3}{16}$ in. plywood, pinned down to fixing battens in the concrete at 4 ft. intervals, and held down with adhesive between them. It is a fairly economical form of finish, extremely well behaved over floor heating. There is very little movement in summer and winter, and it looks most attractive.

My own feeling now is that throughout a house with floor heating downstairs I would stick to that as a good floor finish for the living rooms and dining rooms, not kitchen or utility room. Upstairs I sometimes put down a cheap grade of plywood or hardboard, simply because one cannot very often trust the boarding one gets. I can rely then on plane edge boarding. I do not need to worry so much how it is laid, for I rely on the hardboard or plywood to give a decent finish for close carpeting, lino and so on. Nothing is more regrettable than lino over floor boards. It is so soon marked, and losses the true flatness which is one of its aesthetic merits.

The Chairman: I presume Mr. Allen arranges electrical work and other pipes so that it is easy to cope with them. If you try to get under the floor you have a good deal more to take up.

Mr. W. A. Allen [*A*]: I have not had to get any up yet.

The Chairman: Very good. There are some floor boards in our house that always seem to be coming up.

Mr. W. A. Allen [*A*]: It is not so bad lifting it. You pull up one corner, and the rest comes away.

Mr. George Fairweather [*F*]: Twice this evening, I think, quarter-sawn boarding has been recommended as useful in some capacities. If quarter-sawn boarding was generally available for flooring the necessity for covering it over with hardboard and plywood before carpeting would probably not arise.

Mr. R. M. Hemmings: Quarter-sawn boarding is not so prevalent in the trade today as in the past, especially hardwood and oak. When we had fully quartered panels it was a joy to behold. The trouble is that we are getting so short of decorative hardwoods that we are cutting them up for veneers, but there is no reason why you should not specify quarter-sawn boarding, and the trade will oblige.

I personally prefer a rift sawn plank which makes an excellent flooring. It adds a little to the cost but it gives a wonderful wearing floor.

Then there is the size of the log. You get a small log and it is not worth while cutting it on the quarter; it is best cut through and through and properly kilned. This will help to eliminate some of the turned-up edges we hear so much about.

I am beginning to wonder what sort of timber some of these gentlemen have been getting with open joints and whether the heart side had got on the wrong side.

Mr. C. V. Blumfield: I must say that I have had very interesting experiences in the use of timber in design. I first started designing timber for the Battersea Fun Fair in Battersea Park. We made several very curious structures which although designed for three months are still standing.

As an engineer, there are one or two difficulties in the way of using timber, I find. Some of the difficulties have been removed. The use of timber connectors has made the use of timber much more an engineering job than it used to be.

Then there is considerable uncertainty as to what you can do with the timber as regards strength. You specify a timber, but you are not quite sure whether the timber the contractor is going to use will be the timber you had in mind when designing.

Another point that would be of very great assistance is this. I know that for many thousands of years the timber trade has cut up timber. They will tell you it is 3×5, but it is really something quite different. It is $2\frac{1}{2} \times 4\frac{1}{2}$. Would it not be possible for them to give the exact final size of the timber so that one knew the size of the scantlings one used?

Mr. R. M. Hemmings: One of the points of particular importance in my paper has regard to the selection and stress grading of timber. It is a most important point. If an engineer, when he is specifying a material, knows what it will do under a certain set of circumstances, it gives him confidence. One cannot expect timber to do that, and one has to take into account the type of timber, where it is grown, density, colour, region and all those multitudinous points.

But for structural purposes I have great faith in the stress grading of timber. It is selected for its structural value, and when you have a man who understands the stress grading of timber you have reasonable confidence in the timber you are using.

Regarding the undersize of sawing, I will quote one instance. Until the war we used to import a lot of Crown Austrian Oak, $1\frac{1}{8}$ in. thickness. By the time it was air seasoned and dressed, the plank finished $\frac{7}{8}$ in. thickness, which was accepted. Nowadays a lot of timber comes into the country unseasoned, and it is the conversion of the unseasoned timber that is giving rise to the 'scant' sizes, as we call them.

I would like to stress the point, particularly with regard to 2 in. nominal oak doors.

By the time the oak has been dried and processed in the joiners' shop it finishes approximately $1\frac{3}{4}$ in., and this is generally accepted. Even the floor spring manufacturers now make the shoes for the floor springs accordingly. This reduction does not constitute any difficulty or lowering of standard, but it does give the joinery manufacturer a better chance of straightening out the material.

The Chairman: I think Mr. Blumfield really wants a bit more than that. He told us the difficulties and he wants to know why you cannot say what size you are selling. If he asks for 3×2 he wants 3×2.

Mr. R. M. Hemmings: I see no reason why he should not get it. I should like Mr. Crow to come in on this.

Mr. G. B. Crow: I should like to come in on this libel on the timber trade. I would prefer to take B.S.1860, which lays down not only methods of measuring but also the tolerances in sawn sizes. Any engineer should be working on these tolerances. There are variations in sawing in the length of the piece that have no reference to deliberate scant sawing. Beyond these tolerances, it is up to any engineer to see he gets what he orders.

The Chairman: Thank you, Mr. Crow.

Mr. J. C. Eastwick-Field [*A*]: I cannot help taking up the point about the door being specified as 2 in. and coming slightly less, and that being understood in the trade. We ordered some doors from a specialist manufacturer at 2 in. and the general contractor who is making the frames and lining assumed that they would come something less. They came the full 2 in. and we are now busy planing them down.

A vote of thanks to the speakers and to those who had contributed to the discussion, proposed by the Chairman, was carried by acclamation.

Edinburgh Architectural Association Centenary Celebrations

THE EDINBURGH ARCHITECTURAL ASSOCIATION has now entered its 100th year and it was a happy coincidence that this year also saw the Annual Convention of the Royal Incorporation of Architects in Scotland held in Edinburgh.

The Centenary Celebrations followed immediately after the Convention activities, and enabled many architects from far afield in Scotland to join in the varied activities of the Association.

To match the occasion the Edinburgh Association produced a centenary number of their *Year Book*. This contained a History of the Association by Ralph Cowan, a 'Visitor's Guide to Edinburgh Buildings, 1857–1957', by Colin McWilliam, together with details of the Centenary Medal 'for an outstanding contribution to the Art of Architecture', and a short article on Architectural Education in Edinburgh.

The official activities started on Saturday 1 June with the holding of a symposium in the rather gaunt, marble-lined and heraldically decorated Freemasons' Hall in George Street. The Edinburgh Architectural Association's guest speaker was Professor Steen Eiler Rasmussen on the theme 'The Architect and Society'.

The President of the Association, in welcoming Professor Rasmussen, thanked him for returning to Edinburgh on this occasion to address the Association, and particularly for the honour which the Association was paid by his consenting to take part in the Centenary Celebrations. Mr. Gordon then spoke of Professor Rasmussen's international contributions to architecture, to his intense interest in humanity, and to his inspiring humility when presenting his profound knowledge both in his addresses and his published works.

Professor Rasmussen then addressed the meeting, and the full text is given at the end of this article.

Lord Sempill was then introduced and read a paper, in which he explained that his viewpoint was that of the 'non-architect speaker' but felt that there was a definite relationship between aircraft designs and architecture, both calling for supreme fitness of purpose, together with a technically informed use of the latest materials. 'We ought to be on the verge of a new architecture,' Lord Sempill said, but at the same time wondered if—for example—the U.N. Building ('featureless, downright and repellent') was the correct answer to the creation of a building for 20th-century civilisation. Lord Sempill went on to criticise the lack of day-to-day informed architectural criticism and strongly suggested that newspapers which did not have regular architectural correspondents should start having them at once!

Architecture was not yet, in this century, a true reflection of society, and the goal should be common sense coupled with lasting beauty.

Mr. Richard Sheppard [*F*], in his address to the meeting, pleaded convincingly for a much greater use of technical knowledge by architects, and in particular in relation to building materials. Architectural training fell short of what was required by giving too little attention to scientific studies, and he suggested that until we, as architects, can use scientific studies to the full, we cannot fulfil our function to society. Mr. Sheppard also said that we had failed in our communication with the public. Our method of collecting information from the public—for example, in the study of housing needs—is wrong, and all such information required of the public for planning of any building or buildings should only be based on extensive unbiased functional inquiries.

Professor R. Matthew, C.B.E. [*F*], called the attention of the meeting to the remarkable change in the attitude of the community towards architecture which has taken place during the last 100 years, and to the enlargement of the scope of the architect's thought and responsibility at the end of that century. At the beginning of the century the architect stood on the edge of the community, and we must now be prepared to accept responsibility and be equipped to meet the problems. We must submit ourselves to critical self-examination, to fit ourselves for the rightful position of leaders in the building industry.

The general discussion which followed ranged over many aspects of the relationship of architects to society—the prestige of architects, financial responsibility, the inability to get precise information from clients—particularly now when the client, as a public authority, is many-headed—and the difficulty of maintaining quality in architecture in the face of imposed financial limitations.

Professor Rasmussen consented to wind up the discussion by giving his views. 'We must not forget that the architect's function was to design appropriately to any given circumstances, to form space round humans.' Professor Rasmussen did not think uninformed criticism in public was good, but we ought to give special training to those sensitive enough to undertake the necessary work. 'Personally,' he added, 'I cannot do both criticism and at the same time build.'

The symposium ended just before one o'clock and after lunch other attractions were waiting. A stroll in the warm sunshine in Princes Street Gardens to view the now world-famous Floral Clock. Especially arranged by the city gardeners, the design this year is in the form of the Association's Badge of Office, to record the centenary. During the summer many thousands will admire the clock, but will they pause, just for a moment, to think of the architects, recorded and unrecorded, whose vision and energy produced such a magnificently satisfactory marriage between their art and the excitingly complicated contours of the city? Will they think of the architects in their society?

Our architectural friend wandering in Princes Street might have reflected on the position 100 years from now. Would the architects of today be thanked for their contribution to this, or any other fair city? Would we, could we, compete in our idiom and with new materials with the masters of stone and slate? This would have been a stimulating thought to carry to the exhibition arranged by the Associate and Student Section of the Association. Here in the tranquil setting of Atholl Crescent was an exhibition of old prints, drawings and photographs of the work of members of the Association throughout the last 100 years. Well-known buildings in the city took on new 'faces' with the display of alternative designs, vast abandoned projects held the viewer's fancy, and the ghosts of long-departed friends came to life in superb draughtmanship. The selectors had obviously been most assiduous in their choice, limited as it had to be through lack of space, but the exhibition was thereby more selective. Of special interest in the 19th Century Room were projects for the Scott Monument (1836) by David Roberts, the drawings for the Waverley Station by Blyth and Blyth (1896), and alternative elevations for the University Club by Peddie and Kinnear (1864), and for the Scottish Conservative Club, Sir Rowand Anderson (1879) and, by the same architect, delightfully drawn designs for lamp standards (1894). In the 20th Century Room a drawing by Sir Frank Mears of a 'Design for a large City Hotel, 1907' must be mentioned, as this was complete with helicopters landing on the roof of the hotel! To show that even in the 20th century architects can design anything, there was exhibited a set of drawings by J. B. Dunn and Martin (1927), for a 32-seater single decker bus for Edinburgh Corporation, still reported to be 'in action' as a contractor's run-about! The selection of work for the 20th Century Room ranged over the widest field of work, and included a section of student projects, as well as models of both executed and projected developments.

It is interesting to note that on the occasion of the Jubilee of the Association in 1907, a full and comprehensive exhibition of Scottish architecture was arranged. As then, so in 1957, the exhibition formed an important part of the pattern of celebrations, and was directly aimed at the man in the street.

In the evening a reception in the form of a champagne supper was held in the Royal Scottish Academy, kindly lent by the

Council of the Academy for this occasion. Mr. Esme Gordon [*F*], President of the Association, and Mrs. Gordon received the guests, literally under the seventeen-foot-high birthday cake!

Into the magnificent galleries, displaying the current Academy exhibition, several hundred guests were gathered, representing all aspects of life in Scotland. Ceremonial robes and decorations added colour to the scene.

Among the distinguished guests were the Lord Lyon King of Arms, the President of the Royal Scottish Academy, in the ceremonial attire hitherto only worn at the Coronation of the Queen, Lord Sempill, Sir David Milne, Sir Charles Cunningham, Sir Alexander Glen, Bishop Warner, and Mr. Eldred D. Kuppinger, United States Consul-General in Edinburgh.

On the morning of Sunday 2 June a Service of Dedication was held in St. Giles' Cathedral. Representatives of the Corporation of the City of Edinburgh, the R.S.A., and the Council of the E.A.A. walked in procession to the Cathedral.

The Very Rev. Charles L. Warr, K.C.V.O., D.D., LL.D., one of the newly-elected Honorary Fellows, in his address said:

'On behalf of the Kirk Session and Congregation of St. Giles, and on my own behalf, I cordially welcome the representatives of the Edinburgh Architectural Association, and their professional brethren from elsewhere, who are worshipping with us this morning. This is a great day in the history of the Edinburgh Architectural Association. A hundred years have passed away since it was born, and its members have come here this morning to give thanks to God for all that by His grace and goodness they, past and present, have been enabled to do and to achieve.

'Those who profess architecture carry a great responsibility towards God and man. Like all who work through any art medium, they exert an incalculable influence upon the soul of their country. From the time their art began with primitive man trying to devise shelter for himself from the elements, the architect has been at the very heart of the social, cultural and spiritual development of mankind. Architecture in general, as Friedrich von Schelling put it, is frozen music. The architect has had to plan and adapt buildings not only gracious in line and form according to his vision, but also suitable to the climate of the country and to the evolving customs and needs of the people at their work and in their homes. He it has been who, in their temples, has expressed their religious ideas and aspirations and lifted their eyes to heaven.

'Our 20th century is confronting him with entirely novel problems. The private patron has disappeared, and the public patron as a rule is more concerned with stark utility than with aesthetics. Vast changes have taken place in our social habits and in our economic situation. New types of homes are being built, new housing areas have to be planned, and old towns must be replanned. In our churches new forms of style and design are ousting the traditional, though whether this is due to a more enlightened spiritual perception or to lack of money and materials it is too early to assess. But above all things, it is required of the architect that he have spiritual and intellectual integrity. He must wait upon the Holy Ghost, follow the light as he sees it, and remain impervious to the fickle and ever-changing popular taste. It is for him to lead and not to follow, but, as with all leaders, he must be sure where he is going. As Professor Rasmussen said in his scholarly address yesterday: "The architect may consider it his mission to go against all set ideas of right and wrong in his art. He may shock his contemporaries, and yet be a classic to later generations."

'May the blessing of God continue to rest upon the Edinburgh Architectural Association. Go forth into the future, my brethren, with faith and courage. And of each one of you may it be said at last—"He builded better than he knew." '

In the afternoon Mrs. Esme Gordon, wife of the President of the Edinburgh Architectural Association, planted a Norwegian maple in the centre of the city—in George Street immediately in the grounds of St. Andrew's Church. The Association have, for many years, been actively concerned with all aspects of tree planting and care within the city, and this act of tree planting was as a symbol of this interest and as a reminder to the future generations of members of the Association to guard the heritage of their tree-filled city.

The Architect and Society

By Steen Eiler Rasmussen

WE ALL KNOW perfectly well what an architect is, and we also feel sure that we know what architecture is. But still we find it a little embarrassing if we are asked to define these words or to explain them to those who are not so sure about their meaning as we are.

We maintain that architecture is an art. But it is difficult to determine its object, its medium, its limitations. It works with form and mass as sculpture does, with colour as painting. But still it is completely different from sculpture and painting. It is essential that it solves practical problems, that it is a functional art. This must be kept in mind in all reflections on architecture. While the sculptor or the painter aims at something with merely visual qualities, the architect creates implements for human beings—I use here the word 'implements' in its widest sense. Architecture is a very special functional art. It confines space so we can dwell in it, creates the framework round our lives.

Seen from an aeroplane high in the air even the most gigantic skyscraper is only a tall stone block, a mere sculptural form, not a real building in which people can live. But as the plane descends from the great height there will be a moment when the buildings change character completely. Suddenly they have human scale, are houses for human beings like ourselves, not the tiny dolls observed from the heights. This occurs at the instant when the contours of the buildings begin to rise above the horizon and the structures are seen from the side instead of from above. The buildings pass into a new phase of existence, become architecture instead of neat toys—for architecture means shapes formed round man, formed to be lived in, not merely to be seen from the outside.

The architect is a sort of theatrical producer, the man who plans the setting for our lives. He has much in common with the landscape gardener. Everyone can understand that his success depends on whether or not the plants he puts in the garden thrive there. No matter how beautiful his conception of a garden may be, it will still be a failure if it does not create the right environment for the plants, if they cannot flourish in it. The architect, too, works with living things—with human beings, who are much more incalculable than plants. If they cannot thrive in his house its apparent beauty will not help it; without life it becomes a monstrosity. Indeed, one of the proofs of good architecture is that it is being utilised as the architect had planned.

I remember being shown a fine Danish villa. It was planned by one of our leading architects who had designed not only the whole structure but the complete interior with furniture, textiles and lamps. Everything bore witness to his refined taste and extraordinary sense of beauty. But it looked more like an exhibition of an ideal home than like a home ideal for the people who lived in it. There was not a trace of life. The well-balanced geometry of the rooms was nowhere disturbed by the black and white square of a daily paper lying about, nor was the colour scheme disrupted by an embroidery or piece of knitting waiting to be taken up. I asked the family where they mostly spent their leisure in this beautiful house. They took me up in the attic and showed me two little rooms which were not arranged by the otherwise omnipresent architect. I believe that the right term for the atmosphere up there would be 'snug' or 'cosy'. The style I would designate as very late Victorian. The keynote was comfort. Here were all the photographs and other personal pictures belonging to the family, and many knick-knacks, books and periodicals.

In this case the architect strove in vain to be the instructor of the tragi-comedy of the client's life. But he understood too little of the psychology of his main actors to be able to create a true and convincing performance.

I thoroughly believe that it is the architect's duty to serve his client, to serve the society in which he lives. But it does not therefore follow that the client or society should dictate the doings of the architect. If they were able to do so, if they could visualise the buildings, they would need no architect. He is the man who can

materialise what other people can express only in very vague terms.

The architect has a great responsibility. He puts his stamp on the environments he creates and they in their turn exert their influence on the inhabitants. His buildings become more than simply useful objects.

We know from our daily lives how much man-made environments mean to us, how they are able to mould us. The man who enters a tennis court is immediately filled with a sense of fitness. Everything connected with the game arouses the same sensation. The garb is loose and comfortable, the shoes soft. The out-door air is crisp and breezy. All is in keeping with the relaxed condition in which the player moves about the court, idly picking up balls, reserving his energy for the speed and concentration that will be demanded of him the instant the ball is in play. If, later in the day, the same man appears at an official function in uniform or formal dress, not only his appearance will have changed but his entire being. His posture and gait are influenced by his clothes; restraint and dignity are now the keynote.

Coming to an old town with reminiscences of the Middle Ages we find a very special environment. It may be a fortified rock which offers only very limited space for the inhabitants. As the houses could not expand outward but only upward, their precipitous structures tower with many storeys on top of the steep hills. But inside the grim walls a spirit of neighbourliness and protection reigns in the narrow, winding streets. The people live close to each other, and the streets offer charming views as they climb up and down the slopes, giving here and there a glimpse of the castle like a blue tinted mirage high above the heavy, dark masonry of the lower town. Such a town, from outside wild and fierce, from inside a friendly precinct, is more than an interesting rocky mass. For centuries it has given form to a small society, has restricted the outlook of those people who lived and died there, has moulded their minds.

But fortification and protection, which once were so essential, later became unnecessary and a new era began in protest against the romantic irregularity of the old town. Young people found the cramped conditions of a medieval city unbearable. Urban life, they felt, should be more civilised and dignified. A new town was founded with noble streets, all very regular, wide and open, leading to grand squares and graceful circuses. While the old town was perched high like an eagle's nest, the new town articulated the gentle slopes down to the sea with classical, horizontal masses. Can there be any doubt that also the new town exercised a strong influence on the people who came to live in it? Must not such environments result in a mentality of balance and good manners, of harmony and order?

We, the children of a much later period, can—in spite of all contrasts—appreciate the charm both of the old town and the new. We understand that it is vain to strive for eternal beauty. The values of architecture are relative, not absolute. The art has its importance as a means of expression and must be judged and interpreted from its own conditions.

Much literature shows convincingly the correlation between architecture and social life. Small urban societies of the Middle Ages, dominated by the Church, were brought into material form as cathedral cities with one enormous structure soaring high above the petty houses inside the crenellated walls. And the concentration of power in the absolute monarchy manifested itself in the town plan of Versailles, where the guiding principle is straight, wide avenues all leading to one centre and there stands an effigy of the king.

We can go through the whole of history and always find the most complete correlation between social organisation and architectural expression. This fact can lead to the theory that the architect is but the mouthpiece of society. This is simplified in the idea that every period has what the Germans would call its *Zeitgeist*, a spirit of the time, and that this spirit, like other spirits, expresses itself in a sort of automatic writing with the architect as the unconscious medium and the buildings as the stone record of mankind. But these metaphors do not explain anything. There is in fact no time-spirit, no single being that expresses itself but a number of human beings with a common pattern of behaviour. And where in all this does architecture come in? What is cause and what is effect?

In my interpretation of history the artist has often been far ahead of his time. He acts as a sort of inventor. His special gift is to imagine combinations and form ideas which nobody else can visualise. He removes the boundaries of human apprehension. He may consider it his mission to go against all set ideas of right and wrong in his art. He may shock his contemporaries and yet be a classic to later generations.

It is surprising to see how the French succeeded in making Versailles an appropriate setting for an absolute monarchy only a few years after Louis XIV had seized absolute power. This would not have been possible if it were not based on ideas which artists had been discussing for centuries. Versailles and all that it stands for is a fulfilment of a long development which we can trace back to the Middle Ages and which influenced all arts—including the fine art of politics.

At a time when the political sphere within Europe was split up in many small units, architects in Rome were striving to form large, centralised wholes where earlier there had been only a heterogeneous collection of unrelated buildings.

In the Middle Ages the Capitoline Hill had consisted of overgrown, formless slopes crowned by a number of individual buildings. Michelangelo laid plans that would one day crystallise this amorphous mass into one rhythmic composition. The various elements were related to each other and all to the great equestrian statue at the centre in a way the Middle Ages could never have dreamed of. It was a grand Baroque creation visualised and planned a century before the real Baroque period and long before the introduction of absolutism in politics. It is usually said that the Baroque town plan was conceived to glorify the absolute monarch and that therefore everything leads to his statue. But on the Capitol, at least, this was not true. At that time there *was* no absolute king and they dragged out an antique statue in order to have a focus for the new *piazza*. In other words, centralisation as an architectural conception came into being long before the political system.

On the whole, the great Italian architects of the 16th century created plans and buildings which were far ahead of their time. In a city of only 60–70,000 inhabitants, work was started on the gigantic St. Peter's and the plans were worked out for the impressive network of the streets which is still the pride of Rome. The plan of Versailles with converging avenues was taken over from much older Italian gardens. Altogether the city of absolutism owed much to garden planning and to forestry, which works with plantations that are more uniform than any city.

The architects felt that they were there to serve society but they did not try to create what people wanted. Their edifices were intended to stand for centuries. Therefore the architects tried to foresee the future and they formed their buildings with it always in mind.

We cannot claim, however, that art is always in advance of its time. After the revolutionary work of the 16th and 17th centuries—the magnificent town plans and the epoch-making architecture—came the stabilising 18th century when Rome as an architectural monument finally matured—when the lesser architects with discrimination and talent followed in the footsteps of the great masters and completed the city in the spirit in which it was started. It was a stabilising and ripening period, the radiant Indian summer after the storm-swept spring of the Renaissance.

We who live in the 20th century feel that we too are living in a storm-swept spring of great social changes, and architecture cannot be unaffected by it. It is our great responsibility to create new frameworks for coming generations. In the 19th century architects saw it as their problem to design monumental edifices and houses for the well-to-do. At the School of Architecture of the Danish Academy of Art a typical assignment was a royal hunting lodge or a cathedral for a Scandinavian city. Today we design blocks of flats and neighbourhood units. We know that all scientific and technological progress is based on extensive co-operation and good team-work. But nevertheless that which seems to arouse most interest in the architectural world today is still sensational works by individual masters. Not since the days of Bernini have there been architects who have enjoyed the fame of a Frank Lloyd Wright or a Le Corbusier. To many this seems an obsolete tendency, a hang-over from the 19th century greatly intensified by the efficient methods of modern

publicity. For my own part, I cannot help feeling that this is somewhat out of keeping with our times, this cult of the 'master', this hero-worship of the individual.

But yet I understand that in a time of change we must attach great importance to each new experiment. We must try the new paths as they are opened—and here is where the individual artist comes in as the man who shows us what we hitherto have not been able to visualise.

Nevertheless it is still a paradox that—in a very technical age and at a time when we put all our faith in collective work—we go in for buildings which are like colossal sketches carried out in full size—inspiring sketches, I'll admit, which look very handsome in photographs but which in reality are often completely amateurish as far as technique and quality are concerned.

I believe that the architect has a special duty in our time—besides being the experimenting, inspiring artist. He must fight for quality in architecture. The successful struggle for better living conditions for the worker, the labour unions, the extensive specialisation—all these tendencies have had the disastrous result that the artisan no longer takes a personal interest in the quality of his work. Today the architect should not only be a designer, he must also be the man whose special interest it is to see that the work is carried out in the best possible manner. Besides the great innovators, society needs a great number of anonymous workers—competent and reliable architects' assistants both in the office and on the building site. They should unite technical knowledge with high aesthetic conscience and be men who understand the artistic ideas of today and who can bring them safely into the world of reality. Architecture, like great orchestral works, must be performed by a large number of co-operating artists whose personalities merge in the collective endeavour. I believe that the future of architecture is dependent upon our ability to train such modest young architects who will be capable of performing the music of our art.

The Society of Architectural Historians

THE INAUGURAL GENERAL MEETING of the British Society of Architectural Historians took place on Saturday 1 June. The meeting was held in the rooms of the York Institute of Architectural Study, which had been placed at the disposal of the Society by the Director, Dr. W. A. Singleton [*F*]. More than forty people attended the meeting which was under the chairmanship of Dr. Thomas Howarth [*F*]. The architectural profession, various interested Government departments, as well as libraries and educational establishments throughout the country were represented.

The Chairman opened the meeting by outlining the aims of the Society which were, briefly, the provision of a forum for the discussion and dissemination of ideas related to the history of architecture and the publication of significant contributions to the literature of this field. Dr. Howarth went on to survey the developments which had taken place over the last eighteen months and the events which had led to the meeting at York. He explained how a working committee had been appointed by various interested people with the object of inquiring into the possible scope and organisation of the Society and went on to mention the recommendations which this committee had made with regard to membership, subscriptions, publications and affiliation to the Society of Architectural Historians in the U.S.A. A proposed constitution, drafted by a committee appointed by the working committee, was then read by the Acting-Secretary, Mr. Frank I. Jenkins [*A*], and the Chairman opened the meeting to contributions from the floor. An enthusiastic and lively discussion followed, contributed to by Mr. Bruce Allsopp [*F*], Mr. Arthur Arschavir [*A*], Professor R. A. Cordingley [*F*], Mr. Cecil Farthing, Mr. Leslie Ginsberg [*A*], Dr. S. Lang, Mr. Jeremy Lowe [*A*], Mr. W. A. Pantin, Mr. Alan Reed [*A*], Mr. Michael Rix, Mr. Norman Scarfe, Mr. F. H. W. Sheppard, Dr. Helen Rosenau and Mr. Reginald Turnor [*A*]. A vote was then taken and the meeting unanimously approved the action so far taken by the working committee and authorised the committee to make arrangements for the first annual general meeting of the Society, when the constitution would be formally presented for amendment and adoption and the officers and committee elected.

The Chairman then introduced Mr. Howard Colvin [*Hon. A*]. In his address Mr. Colvin outlined the developments which had taken place in the study of architectural history from early times to the present day. There were, he said, three ways in which the study of architectural history could be carried out—by architects, through the study and measurement of actual monuments; by historians, through the study of documentary evidence; and by art historians, through the study of ideologies and styles. It was, Mr. Colvin said, essential that the architectural historian maintained a balance between these approaches, and in this respect he felt that the newly founded Society would serve a useful purpose in bringing together architects, documentary historians and art historians, with their different but interdependent disciplines. A vote of thanks to Mr. Colvin was proposed by Mr. Frank Fielden [*F*] and seconded by Mr. Bruce Allsopp. Afternoon tea was then served and further informal discussion took place.

In the evening some thirty people attended a dinner in the Merchant Taylors' Hall, which proved to be a particularly enjoyable occasion—the candle-lit, 14th-century hall providing an impressive and apt setting for the gathering. The friendly and enthusiastic atmosphere of both the dinner and the meeting augurs well for the Society, which now looks forward to a vigorous and useful life.

Fees for Small Private Houses

SEVERAL ALLIED SOCIETIES have approached the Royal Institute suggesting the fixing of a uniform basis of fees for limited services for small house design.

To solve the problem of differing interpretations, it is considered that a lump sum fee is the best solution, most acceptable to the public and practical to operate.

On the recommendation of the Practice, Public Relations and Town and Country Planning and Housing Committees, the Council have approved the following interpretation of the Scale of Professional Charges, subject to the fees being reviewed from time to time.

In special circumstances where limited services are provided

For small houses not exceeding 1,000 sq. ft. in area, excluding outbuildings:—

For individual owners

A fee of £45 will be chargeable for ascertaining the client's requirements, preparing design and $\frac{1}{8}$ in. scale drawings and particulars sufficient to enable applications to be made for Town Planning, Bye-law (or Building Act) approvals.

This fee covers the preparation of one sketch design and making minor alterations to that design to meet the requirements of the client. It does not include site survey, specification, inviting builders' estimates and commenting upon them, nor supervision.

The fee is to be paid on delivery of the drawings to the client.

For House-Builders' repetitive work

The fees for the limited services described above will be:—

(i) £45 for the preparation of each house type design;
(ii) £2 per house for the preparation of a lay-out to $\frac{1}{500}$ scale;
(iii) A royalty of £8 per house for repeats of type designs.

The fees for house design and layout are to be paid on delivery of the drawings to the client. The royalty for repeats of type designs is to be paid on practical completion of each house after the first.

The architect should agree the maximum number of repeats of type designs to be covered by this clause, which applies to the development of one site only.

In both cases, the limited extent of the services should be clearly understood and explained to the client, and any further services required would involve appropriate fees under the normal Scale of Professional Charges.

Copyright in all drawings and in the work executed from them will remain the property of the architect.

Review of Construction and Materials

This section gives technical and general information. The following bodies deal with specialised branches of research and will willingly answer inquiries.

The Director, The Building Research Station, Garston, near Watford, Herts.
Telephone: Garston 4040.

The Officer-in-charge, The Building Research Station Scottish Laboratory, Thorntonhall, near Glasgow.
Telephone: Busby 1171.

The Director, The Forest Products Research Laboratory, Princes Risborough, Bucks.
Telephone. Princes Risborough 101.

The Director, The British Standards Institution, 2 *Park Street, London, W.*1.
Telephone: Mayfair 9000.

The Director, The Building Centre, 26 *Store Street, Tottenham Court Road, London, W.C.*1.
Telephone: Museum 5400 (10 *lines*).

The Director, The Scottish Building Centre, 425–7 *Sauchiehall Street, Glasgow, C.*2.
Telephone: Douglas 0372.

An Experimental Fire. The Cape Building Products Ltd., in conjunction with Colt Ventilation Ltd., recently staged an experimental fire at their Cowley Bridge Works. The experimental building was a tubular steel framed building 30 ft. long by 20 ft. wide by 20 ft. 6 in. to apex, divided into three bays, of which two bays were to be the scene of the fire, the third being protected. One side of the building was sheeted with standard corrugated metal, the other side being sheeted mainly with Robertson Thain's Galbestos and partly with their R.P.M. sheeting. The roof was lined with standard Asbestolux sheets suspended in steel tee sections with Rocksil building mat laid over the back. Asbestolux strips were screwed to the faces of the tee sections. The walls were lined with Asbestolux panels backed with Rocksil.

The two 'hot' bays to be the scene of the outbreak of fire were vertically separated from the protected, or 'cold', bay by an asbestos cloth curtain fixed on a roller attached to the tie beam of the truss, the triangular space up to the apex being lined with Asbestolux sheeting. Two Colt dual purpose heat and smoke exhausts were mounted in the hot bays and one in the cold bay. Fusible links operated the curtain and the Colt ventilators. Two tons of timber, 20 gallons of kerosene and some rubber tyres were used to start the fire, and to add realism storage racks were placed in the hot and the cold bays, and identical objects were placed in each so that the effect of fire on them could be observed.

Within a minute of the fire being started the fusible link controlling the curtain melted, allowing the curtain to drop and cut off the cold bay from the two hot ones. A few seconds later fusible links in the hot bays, set to operate at 158° F, melted and the Colt exhausts opened and drew up smoke and heat. The fire was maintained for half an hour and when the building was cool enough to be inspected it was found that in the hot bays the asbestos roof lining was intact, with only surface discoloration and surface cracking; the triangular sheeting to the truss was similar; in the Asbestolux wall lining two or three panels fractured *on cooling*, the other linings remained intact; most of the bitumen binding of the Rocksil building mat vapourised off, but the wool remained attached to the back of the Asbestolux; the asbestos cloth curtain was intact; the surrounds of the Colt exhausts were twisted and the fins were melted; the other components were virtually undamaged. In the cold bay, protected by the curtain, the structural components were unaffected, including the Colt exhaust, and the electric lights were working.

The result of the experiments, as assessed by the promoters, was that the structure was effectively protected by the Asbestolux lining, that the Colt exhausts quickly and effectively cleared the fire compartment of smoke and reduced the temperature in the cold bay, and that the curtain and the apex fire stop above the curtain effectively prevented flame from reaching the protected bay.

After the experiment was concluded an informal discussion was held, at which the chairman was Mr. Eric L. Bird [*A*], Technical Education Officer of the Building Centre.

Escape from Fire. The London County Council are embarking on a county-wide publicity campaign to draw public attention to the importance of satisfactory means of escape from buildings in case of fire, to establish the responsibilities of owners for providing them and the need of tenants to be aware of them. To this end the L.C.C. have approved the issue of a leaflet, *Why burn to death*, and a booklet, *Escape from fire*, which contains more detailed advice than the leaflet on the provision of means of escape and on the prevention of the spread of fires. The booklet may be obtained on application to the L.C.C., County Hall, London, S.E.1.

The Fordham Cleanline Cistern. The Council of Industrial Design have approved the new Fordham Cleanline water waste preventing cistern for display at the Design Centre; they are also including it in their DESIGN REVIEW. This pressed steel cistern can be had in vitreous finish, white, black or coloured. Apart from its looks, the advantage claimed for this cistern is that it is silent and will flush freely and instantly under any conditions of water. The interior mechanism includes the Fordham all polythene syphon and ball float, which are virtually indestructible, will not corrode even in acid, and cannot jam even in extremes of heat or cold.

For hospitals and similar institutions, where hygiene is important and the possibility of infection being spread through hand contact is to be avoided, the cistern can be operated by a foot pedal, and both high- and low-level types are available, capacities being 2, 2½ and 3 gallons.

Full information can be obtained from Messrs. Fordham Pressings Ltd., Melbourne Works, Dudley Road, Wolverhampton.

B.S.I. Building Handbook. The British Standards Institution announce the issue of the third packet of addendum sheets for insertion in the handbook. It will be remembered that it was for the easy accommodation of such additional sheets that the handbook was published in loose-leaf form in 1955. This third packet contains sheets summarising three additional B.Ss. and 13 revisions of summaries already in the handbook. Also included is a completely revised index to the 300 Standards covered by the handbook.

The price of the new set of sheets is 7*s.* 6*d.* post free.

Building Bulletin No. 11: Amendment. The Ministry of Education have issued Amendment No. 1 to Building Bulletin No. 11, *Design of School Kitchens.* An introductory note says, 'Experience has shown that the advice given in Appendix 2 (Table of Main Equipment, Storage and Accommodation) of Building Bulletin No. 11 requires some revision. The major amendment is to bring the scales for primary schools into line with those for secondary, but a few other minor amendments have been made both to the table and the notes'.

Published by H.M.S.O., price 4*d.* net.

A New Fire-Check Door. Messrs. Thames Plywood Manufacturers Ltd., of Barking, Essex, announce the production of the Thamesply-Werno 'half-hour' fire-check door, tested and passed by the D.S.I.R. and the Fire Office Committee of the Joint Fire Research Organisation. The door is 1¾ in. thick, the inner core of Thames-Werno is covered on both sides with $\frac{3}{16}$ in. composition asbestos faced with plywood. The door can be made to size according to architects' specification, and glazing openings up to an area of 2 sq. ft. can be provided.

Messrs. De La Rue's Showrooms. Messrs. Thomas De La Rue and Company Ltd. have recently opened showrooms at 84–88 Regent Street, London, where they show a complete range of all their industrial products, including formica, delaron and traffolyte laminated plastics. A special bay displays the products of the Potterton division which manufactures gas and oil-fired boilers, gas cookers and infra-red panels.

Practice Notes

Edited by Charles Woodward [*A*]

IN PARLIAMENT. **Planning Permission (Applications).** Asked if he was aware that it is possible under the provisions of the Town and Country Planning Act, 1947, for a stranger to obtain planning permission in respect of land without the knowledge of the owner, and that fraud could result; whether he is satisfied with this situation; and what action he proposes to take to remedy it, the Minister of Housing and Local Government replied:—It would require legislation to change this situation. I can see that the present arrangement is open to some objection, and yet any other arrangement might well create more difficulties than it would cure. I should be glad to consider any suggestions which my hon. Friend may have. (4 June 1947.)

MINISTRY OF HOUSING AND LOCAL GOVERNMENT. Rent Act, 1957. Circular 32/57 dated 6 June refers to this Act which came into force on 6 July. The Circular is addressed to housing authorities in England and Wales and gives detailed notes of particular interest to local authorities. It is emphasised as being of special importance that local authorities should exercise their powers under the Rent Acts to give information, and, where there is a Citizens' Advice Bureau in the area, to discuss matters with the Bureau.

Local authorities can assist tenants and owners by being ready to give loans for house purchase, for conversions and for repairs and improvements. Grants can also be given for improvements and these will be particularly important where the work amounts to conversion and the production of additional dwellings. The Minister hopes that Councils will do everything possible to encourage work of that character in the next year or two.

The Circular is obtainable at H.M. Stationery Office, price 6*d.* net.

The Ministry have published a booklet *The Rent Act and You, Questions and Answers for Landlord and Tenants*, which is obtainable at H.M. Stationery Office, price 6*d.* net.

LAW CASES

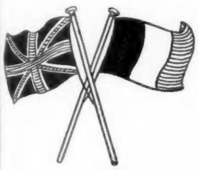
Attorney-General v. P.Y.A. Quarries, Ltd. Court of Appeal. 15 March 1957. Meaning of 'public nuisance'. This was an appeal from a Judge's decision granting an injunction restraining the defendants from causing a nuisance from dust and vibration from their quarrying activities to householders in the vicinity. The appeal was on the ground that the Judge had failed to differentiate between a public and a private nuisance.

In dismissing the appeal the Court of Appeal held that any nuisance was 'public' which materially affected the reasonable comfort and convenience of life of a class of Her Majesty's subjects. The 'sphere' of the nuisance might be described generally as 'the neighbourhood', but the question whether the local community within that sphere comprised a sufficient number of persons to constitute a class of the public was question of fact in every case; it was not necessary to prove that every member of the class had been injuriously affected, but it was sufficient to show that a representative cross-section of the class had been so affected for an injunction to issue. A public nuisance is a nuisance which is so widespread in its range, or so indiscriminate in its effect that it would not be reasonable to expect one person to take proceedings on his own responsibility to put a stop to it but that it should be taken on the responsibility of the community at large. (1957. *All England Law Reports*, Vol. 1, p. 891.)

Massey Estates Ltd. v. War Damage Commission. Making good war damage, cost of auxiliary work. In the JOURNAL for December last on page 72 this case was noted, where the Judge held that the cost of repairs to party walls consequent upon rebuilding the front wall of the premises which had been war damaged, was part of the 'proper cost' of making good war damage.

The Commission appealed, and on 3 June the Court of Appeal reversed the decision in the court below and held that the work required to be done to the party walls was not due to war damage and the Commission were therefore not liable for payment. Leave to appeal to the House of Lords was given. (The case was reported in THE TIMES for 4 June and in THE ESTATES GAZETTE for 22 June.)

The Franco-British Union of Architects



THE TWENTY-EIGHTH Annual General Meeting of the Franco-British Union of Architects was held from 13 to 18 June in France, with headquarters at the Chartreuse des Milandes, near Souillac, in the Dordogne Department.

Numerous excursions to places of historical and architectural interest were included in the programme. This commenced with a visit on 14 June, on the way to Les Milandes, to the 12th-century church at Souillac, which is now being restored by the Commission des Monuments Historiques and which (like many other churches in the district) shows traces of English influence. On Saturday 15 June the prehistoric caves at Lascaux were visited. These caves contain thousands of drawings of animals in yellow, red and black, which are remarkable for their skilled craftsmanship and lively suggestion of movement. The two boys who accidentally discovered the caves (which are under the care of the Commission des Monument Historiques) are now employed there as guides. In the afternoon Périgueux was visited, where, under the guidance of the Regional Architect of the Department, we saw the interesting cathedral of St. Etienne-de-la-Cité, an early Romanesque building of which only two bays now remain, the remains of part of the Roman fortifications, the celebrated church of St. Front, the Maison des Consuls, and many other buildings of architectural interest.

Sunday 16 June was a full day commencing with a visit to Sarlat, a town with many picturesque buildings of the 15th, 16th and 17th centuries, huddled together along tortuous, narrow streets round the cathedral. The Annual General Meeting was held before lunch at the Hôtel du Lion d'Or et de la Madeleine.

At this meeting Monsieur Laprade, Architecte en Chef des Palais Nationaux et Bâtiments Civils (Vice-President) was unanimously elected President for 1957–58. Mr. R. E. Enthoven [*F*] was elected Vice-President for the same period. Monsieur René Varin, Cultural Counsellor to the French Embassy in London, was elected an honorary member, and the following were elected ordinary members of the Union: M. Boutet de Monvel, S.C., S.A.D.G., M. Carpentier, S.A.D.G., Mr. C. Gray, F.R.I.A.S. [*L*], Mr. Rigby Lee [*A*] and Mr. J. C. Ratcliff, O.B.E., A.M.T.P.I. [*F*].

It was decided that the 29th Annual General Meeting should be held in England, with York as headquarters, during the month of June 1958.

The question of the reciprocal recognition of the diploma of 'architect' by Great Britain and France was discussed. Monsieur Gutton, who has had meetings with the French authorities concerned, said he thought a solution of the problem was possible. It was agreed that he should write to the Secretary-General and that the matter should then be referred to the British and French Committees, who would prepare reports for the next Annual General Meeting.

Professor H. O. Corfiato, F.S.A., S.A.D.G. [*F*], proposed that, to encourage the attendance of young members, one young member from each country should be invited by each national committee and that a sum sufficient to cover expenses should be added to the amount due from members attending the Annual Meeting. This was approved for study by the Committees of the French and British Sections. Monsieur Laprade proposed that time be provided, in the programme for future

meetings, for a free discussion of some subject of common interest to architects of both countries. This proposal was accepted. During the afternoon there were visits to Montpazier, an old walled town, built mainly during the English occupation, with covered arcades round a central market-place, and an interesting Romanesque and early Gothic church, showing English influence, and to the historic Château de Biron (12th to 17th century), once again under the guidance of the Architect for the Department of the Dordogne.

From Biron we returned to Les Milandes where, before the official dinner, we were entertained to a cocktail party by M. and Mme. J. Baker (the owners of the Château and Chartreuse des Milandes) and were introduced to the ten small children of all races and colours who have been adopted by Mme. Josephine Baker. Later in the evening the usual official dinner, at which British members were the guests of the French Section, was held at Les Milandes. This concluded the meeting. Among those who attended were: M. Boutet de Monvel; M. and Mme. Barade; M. and Mme. Bodecher; Lieut.-Colonel O. Campbell-Jones, T.D. [*F*], and Mrs. Campbell-Jones; Mr. P. Campbell-Jones [*A*]; Mr. M. Campbell-Jones; Lieut.-Colonel H. P. Cart de Lafontaine, O.B.E., T.D. [*F*]; M. Carpentier; M. Coulon; Mr. S. E. T. Cusdin, O.B.E. [*A*], and Mrs. Cusdin; M. and Mme. H. Defrasse; Mr. and Mrs. Enthoven; M. Froidevaux; M. Gutton; Mr. and Mrs. Rigby Lee; M. and Mme. Laprade; Miss H. Martin [*A*]; Mr. and Mrs. Marr-Johnson; Mr. J. H. Peek [*L*] and Mrs. Peek; M. Schneider; M. and Mme. Tournon; Mlle. M. Tournon; and M. and Mme. Warnery.

Correspondence

PLANNING PERMISSIONS

The Editor, R.I.B.A. Journal

DEAR SIR,—One would like to think that the suggestion made in W. T. Jeffries' letter in the June issue of the JOURNAL would work, but can we believe that an architect's endorsement of plans could be effective?

When we note, wherever we go, the speed with which badly designed and badly sited houses and bungalows are spreading over the country, and the ease with which these designs appear to obtain planning approval, one is, I fear, a little sceptical.

Once the man in the street demands good design there will be a change for the better. This surely means education in the visual arts which requires patience and a long-term policy. The method adopted by the R.I.B.A. and some Allied Societies of putting on public exhibitions of architecture with good publicity and propaganda, seems to be one good way of trying to interest the public. Perhaps more of this sort of thing should be done?

Yours faithfully,

G. L. THOMPSON [*F*]

SIR,—No one in his senses would disagree with Mr. Jeffries that all buildings should be designed by architects, or at least certified by an architect as 'up to his normal standard'. Mr. Jeffries hopes that the profession will then exercise a 'broad control over the quality of design'.

The problem is really one of the architect's status. At the moment he runs the gauntlet of planning control along with the speculative builder, who seems to be winning very comfortably. Control depends entirely on the personality of the Planning Officer. He may be enlightened, though he usually is not. Who, except the most eccentric architect, can afford to delay a project 18 months while the Minister expresses an equally personal opinion?

I suggest Mr. Jeffries makes a practice in his county of passing automatically all qualified architect's plans, and obstructs as far as possible every submission by an unqualified person. If, at the same time, his department made it known that plans signed by architects would receive favourable and speedy attention, his hopes for the profession might be fulfilled.

Yours, etc.,

THEO CROSBY [*A*]

Book Reviews

House Maintenance for the Intelligent Owner, by *Eric Bird*. 8¾ in. xii + 180 pp. incl. illus. A. & C. Black. 1957. 15*s*.

There is always something rather pleasurable in receiving a book from the author, and a feeling of slight superiority. When Mr. Eric Bird sent me his latest book on House Maintenance, I was indeed grateful, for I knew there would be something in it of use to many people because he is always trying to help the handy-man. I realised it was not written for the technical person, so I started just to glance through it, but soon found myself reading it, which is a sure proof that there is more in it than one thought, and when I was asked by the Editor of the JOURNAL if I would review it, I was delighted to say that I would.

The book is written for the house owner and explains to him how the various parts of the structure are made up. It shows what should be done to keep the house in good working order, and why. It compares the upkeep of a house with that of a motor car, pointing out that a certain wear-and-tear takes place, and this, if neglected, will depreciate its value and may lead to trouble which, with a little care, might be avoided.

The first diagram gives the names of the structural parts of a house in a very clear manner which enables the owner to become familiar with technical terms, and throughout the book the various parts are shown in greater detail, explaining how they are constructed. These diagrams are extremely simple, and should be readily understood by the average person. I do not think there are any parts which have not been explained. The hot-water system is perhaps the most difficult to demonstrate by diagrams, and I think most people would find this part complicated. Nevertheless, it has not been shirked but has been carefully drawn out and, with patience, can be followed.

The book deals with nuisances and pests such as noise, both internal and from outside, smoky fireplaces, wood-boring beetles and bugs; and even burglars have a paragraph. Home safety is rightly dealt with and this cannot be given too much emphasis, as simple things can do untold harm.

Mr. Bird winds up his book by discussing the employment of an architect, contract administration, and improvement and conversion grants, so there is really nothing missed out. I think it is an excellent manual for the householder, and I would add the recommendation that every architectural student should read it: his time will not be wasted.

ARTHUR W. KENYON [*F*]

Farm Buildings. Conversions and Improvements, by *W. G. Benoy*. 11¼ in. viii + 141 pp. incl. illus. Crosby Lockwood. 1956. 28*s*.

In recent years there has been a revival of technical books dealing with 'Conversions and Improvements' of buildings. A welcome new one now appears dealing with improvements of farm buildings and homesteads, which should find a place on the bookshelves of the rural practising architect, who will be able to glean much useful technical farm knowledge from between its covers. The text is both informative and simply phrased, and is obviously addressed in the first place to the small farmer. The selection of 'before and after' examples, illustrated chiefly by plans and photographs, are not generally up to the standard of the remainder of the book. The plans are generally too small to be of much value, and the various photographs often explain the text inadequately.

A chapter devoted to the farmhouse and cottage would have been better left out altogether, for the examples chosen are again poorly illustrated and, regrettably, of little architectural merit. In fact, throughout the book, the standard of architectural design appears to have been little considered, and no mention is made of the need for good design in the landscape. It is also a pity that no advice is given about the services of the architect and his fees. A bibliography would have been useful.

N. H. GODSMARK [*A*]

The Ultimate-Load Theory Applied to the Design of Reinforced and Prestressed Concrete Frames, by *A. L. L. Baker*. 9¼ in. x + 91 pp. text illus. Concrete Publications Ltd. 1956. 18*s*.

The ultimate-load method of calculation which, Professor Baker states in his preface, provides a true value of the factor of safety, is based on the load which will cause failure of the whole structure, and not on the elastic theory now generally used. Half the book is occupied by a description of the theory of plastic hinges which, combined with the ultimate-load method, makes possible a more economical design.

Notes and Notices

NOTICES

Session 1956–1957. Minutes XIV. At the Ninth General Meeting of the Session 1956–1957 held on Tuesday 18 June 1957 at 6 p.m., Mr. Kenneth M. B. Cross, M.A., President, in the Chair.

The meeting was attended by about 200 members and guests.

The Minutes of the Eighth General Meeting held on Tuesday 21 May 1957 were taken as read, confirmed and signed as correct.

The following members attending for the first time since their election were formally admitted by the President:—*As Fellow:* A. V. Elliott. *As Associate:* Keith Cattell.

The Secretary having read the report of the Scrutineers on the result of the Annual Election for the Council, the President declared that the members of the Council and the Honorary Auditors for the Session 1957–1958 were duly elected in accordance therewith. On the motion of the President, a vote of thanks was passed by acclamation to the Scrutineers for their labours, and was briefly responded to by Mr. E. H. Firmin [*F*], Chairman of the Scrutineers.

Then followed a debate on 'Systems of Proportion', the subject being introduced by Dr. Nikolaus Pevsner, C.B.E., M.A., F.S.A. [*Hon. A*]. The motion before the Meeting was 'That Systems of Proportion make good design easier and bad design more difficult'. Mr. E. Maxwell Fry, C.B.E. [*F*], and Mr. W. E. Tatton Brown [*A*] spoke for the motion and Mr. Misha Black, O.B.E., and Mr. Peter D. Smithson [*A*] spoke against the motion.

A debate having taken place, the motion was put to the meeting and was defeated by approximately 60 votes to approximately 48 votes.

The proceedings closed at 8.03 p.m.

Building Surveying Examination. The R.I.B.A. Examination qualifying for candidature as Building Surveyor under Local Authorities will be held at the R.I.B.A. on 9, 10 and 11 October 1957. Applications for admission to the examination must be made not later than 31 July on the prescribed form to be obtained from the Secretary, R.I.B.A.

Election Void. Under the provisions of Bye-law 17 the election as Associate of the following has been declared void: George Raphael Michael Kennedy.

Disciplinary Action. Mr. Kenneth Luther Davies, of Queens Chambers, 41 High Street, Newport, Mon., an Associate, and Mr. Wilfred Edgar Hole, of Dunster, The Rise, Llanishen, Cardiff, a Licentiate, were reprimanded by decree of the Council dated 2 July 1957, made pursuant to the Bye-laws.

COMPETITIONS

Development of the Leith Fort Housing Area. Last day for submitting designs: 30 November 1957.

Full particulars were published in the JOURNAL for June, page 342.

Civic Centre for the Borough of Enfield. Last day for submitting designs: 18 November 1957.

Full particulars were published in the JOURNAL for May, page 287.

International Competitions. A note has been received from the International Union of Architects that the conditions of the following competitions have been approved by them:

Development of Berlin Centre. Last day for submitting designs: 30 November 1957.

Full particulars were published in the JOURNAL for May, page 287.

Quaid-e-Azam Mohammed Ali Jinnah Mausoleum at Karachi. This competition, organised by the Central Committee of the Quaid-e-Azam Memorial Fund, is open to all architects, engineers and town planners irrespective of nationality. Projects submitted are to be signed by the competitors.

Closing date: 31 October 1957.

The Jury of Assessors includes Professor Eugene Beaudouin, Professor Robert Matthew, Professor Pier Luigi Nervi, Signor Gio Ponti and M. Georges Candilis.

Premiums: 25,000 rupees and contract; 15,000 rupees; 10,000 rupees, to be awarded to other projects at the discretion of the Jury.

Conditions are obtainable from the Secretary-General of the International Union of Architects, 15 Quai Malaquais, Paris VIIeme.

Deposit: 3,000 French francs.

Last date for applying for conditions: 31 July 1957.

Last date for questions (to be sent to the Secretary-General of the International Union of Architects): 31 July 1957.

Competition for New Wallpaper Designs. A competition for new wallpaper designs is being organised by the Danish Wallpaper Manufacturers, Fiona, Inc., Fåborg, Denmark, in collaboration with the National Federation of Danish Architects (Danske Arkitekters Landsforbund) and the Danish National Association of Industrial Design.

Closing date: 27 August 1957.

The Jury of Assessors includes three architects, Mr. Erik Herløw, Mr. Åke Huldt and Signor Gio Ponti.

Premiums: 6,000 Danish crowns; 6,000 Danish crowns to be awarded to other prize winners at the discretion of the Jury; Fiona Inc. may also purchase designs submitted for the competition.

A limited number of copies of the conditions are available and can be obtained from the Secretary, R.I.B.A.

COMPETITION RESULTS

International Competition for the Lay-out of the Place des Nations and the Approach to the Secretariat of the Palais des Nations, Geneva.

1. Messieurs André Gutton and Yves Roynard (France).

2. Herren Rainer Schell, H. G. Moeller and K. Brinkmann (German Federal Republic).

3. Signor Vico Magistretti and Signor Mario Righini (Italy).

4. Herr Deinert Hein (German Federal Republic).

5. Mr. Jaroslav Otruba and Miss Nadeje Otrubova (Czechoslovakia).

Purchases:

Professor Wolfgang Rauda and Herren H. Peter Schmiedel, Manfred Zumpa, Ralf Peschel and Max Lachnit (German Democratic Republic).

Messrs. Ivan Ruller, Zdenek Rihak, Jaromir Sirotek and Bohumir Matal (Czechoslovakia).

Messieurs Samuel Eggar and Zollikofer (Switzerland).

Messieurs R. Engeli, R. Pahud, C. Bigar and Milo Martin (Switzerland).

The Town Planning Department of the Ministry of Public Works, Budapest. (Messrs. Bossai, Csavlek, Benesi, Farkas, Gyarfas, Kiss, Lux, Novak, Sedlmayr, Szerdahelyi, Visontai, Weiner, Zsitva and Megyeri.)

New Technical College Buildings, Paisley, Scotland.

Correction: In the list published in the JOURNAL for June, page 342, the last name should have been printed as follows: Messrs. D. H. Lanham [*A*] and E. A. Barber [*A*].

ALLIED SOCIETIES

Changes of Officers and Addresses

Bristol Society of Architects. President, E. F. Tew, R.W.A. [*F*].

Coventry Society of Architects. Chairman, E. T. Baldwin [*F*]. Hon. Secretary, Hugh R. Souper [*A*], Gordon House, Golf Lane, Whitnash, near Leamington Spa.

East Anglian Society of Architects and *Suffolk Association of Architects.* President, Birkin Haward [*A*].

Northamptonshire, Bedfordshire and Huntingdonshire Association of Architects. Hon. Secretary, P. B. Dunham [*F*], 42/44 Hastings Street, Luton, Beds.

South Eastern Society of Architects, Maidstone Chapter. Chairman E. T. Ashley Smith [*F*]. Hon. Secretary, Gordon W. V. Bonner [*A*], 'Dinant', 67 Buckland Road, Maidstone, Kent.

West Yorkshire Society of Architects, Harrogate Branch. Hon. Secretary, H. Cedric Tempest [*A*], 461 Idle Road, Bradford.

Royal Australian Institute of Architects. President, W. T. Haslam [*F*]. Hon. Secretary, T. B. F. Gargett [*F*]. Secretary, R. S. Greig, Daking House, Rawson Place, Sydney, N.S.W., Australia.

Manitoba Association of Architects. President, Norman C. H. Russell.

Bristol and Somerset Society of Architects. The annual cricket match between the Bristol and Somerset Society of Architects and the Bath Group was played at Thornbury, by kind permission of the Thornbury Cricket Club, on Wednesday 26 June.

In a low scoring game Bristol won by 22 runs, Peter Smith taking seven of the Bath wickets for twelve runs.

After the cricket match the annual summer dance was held in the Ship Hotel which overlooks the ground. Music was provided by the Avon Cities Jazz Band, now nationally famous. This band was originally founded by Bristol architectural students and their friends, and one member of the Society is still a regular member of it.

Essex, Cambridge and Hertfordshire Society of Architects, Hertfordshire Chapter. Certificate of Craftsmanship. The Hertfordshire Chapter of the Essex, Cambridge and Hertfordshire Society of Architects are inviting nominations for the award of the Certificate of Craftsmanship for 1956–57 in respect of work executed in the County of Hertfordshire within the past two years.

The award is made in two classes:—

1. For general excellence of workmanship.
2. For an individual piece of workmanship.

Further particulars from the Hon. Secretary, W. Wesley Turney [*L*], of 63 Wood Street, Barnet, Herts.

Manchester Society of Architects. Annual Dinner. The annual dinner of the Manchester Society of Architects was held at the Masonic Temple, Manchester, on Monday 13 May. Mr. Leonard C. Howitt, M.T.P.I., Vice-President R.I.B.A., and President of the Society, was in the chair. The function was very well attended. Members and guests were received by Mr. and Mrs. Howitt and by Dr. J. Leslie Martin, Vice-President R.I.B.A., and Mrs. Martin.

Among the principal guests were the Lord Mayor, Councillor Harry Sharp, J.P., and the Lady Mayoress; Mr. S. D. Cleveland, F.M.A., Director of the City Art Gallery, and Mrs. Cleveland; Mr. John R. Gauld, A.R.C.A., President of the Manchester Academy of Fine Arts; Mr. Derek G. Bee, F.C.A., President of the Manchester Society of Chartered Accountants, and Mrs. Bee; Mr. D. J. Macbeth, President of the Manchester Law Society, and Mrs. Macbeth; the Very Reverend H. A. Jones, Dean of Manchester, and Mrs. Jones; Professor W. Mansfield Cooper, Vice-Chancellor of the University of Manchester, and Mrs. Mansfield Cooper; Miss Margaret Pilkington, O.B.E., F.M.A., J.P., President of the Royal Manchester Institution; Mr. P. L. Hughes, O.B.E., Principal Regional Officer, Ministry of Housing and Local Government, and Mrs. Hughes; and the Presidents of several Allied Societies.

The Dean of Manchester proposed the toast of the R.I.B.A. and Dr. J. Leslie Martin responded. The toast of the City of Manchester was proposed by the President, Mr. Howitt, and Councillor Sharp responded. Mr. H. T. Seward [*F*] proposed the toast of The Guests to which Professor W. Mansfield Cooper replied.

Sheffield, South Yorkshire and District Society of Architects and Surveyors. Travelling Scholarship. For the first time the Sheffield, South Yorkshire and District Society of Architects and Surveyors has offered a travelling scholarship to its members, and the first award of £50 has been made to Mr. A. F. Ward [*A*], who has submitted a Programme of Study on Cladding Materials for Contemporary Structures, Their Application and Performance.

The Royal Incorporation of Architects in Scotland. Annual Convention 1957. This year the Annual Convention of the Royal Incorporation of Architects in Scotland was held in Edinburgh, to herald the celebrations for the 100th Anniversary of the formation of the Edinburgh Architectural Association (details of which are given on page 380). The Convention opened with the Annual General Meeting held on the afternoon of Friday 31 May, when the Annual Report was presented and the new President, Mr. Thomas H. Thoms [*F*], was installed. There was a lively discussion, resulting in the decision to form a committee to review the state of the profession in Scotland. The Annual General Meeting was followed by a Civic Reception given by the Lord Provost of Edinburgh.

In the evening the Annual Dinner was held at the Caledonian Hotel, at which the Guest of Honour was the Right Hon. Hugh Molson, M.P., Minister of Works. Mr. Harold Conolly [*F*], Vice-President, R.I.B.A., replied to the toast of the Architectural Profession on behalf of the R.I.B.A., and Mr. Thoms on behalf of the R.I.A.S. Mr. A. Esme Gordon [*F*], President of the Edinburgh Architectural Association, proposed the toast of The Guests, and the reply was given by Sir William Hutchison, President of the Royal Scottish Academy.

At the dinner, the first Centenary Medal was presented to Professor Robert Matthew [*F*]. This is an award newly instituted by the Edinburgh Architectural Association for a building of outstanding merit completed by past or present members of the Association. The award was for the Edinburgh Airport Terminal at Turnhouse.

GENERAL NOTES

Museum Wishes to Trace Objects by C. F. A. Voysey. The Victoria and Albert Museum is to hold an exhibition in November and December of this year to commemorate the centenary of the birth of the late Victorian architect and designer C. F. A. Voysey. The Museum has an excellent collection of Voysey's works, but is anxious to trace, and borrow for the exhibition, further examples of his furniture, embroideries, textiles and wallpapers. Any individual, institution, firm, etc., possessing such works or information about Voysey, is asked to send details to Peter Floud, Esq., C.B.E., Keeper of the Department of Circulation, Victoria and Albert Museum, London, S.W.7.

Central Housing Advisory Committee. Housing Management Sub-Committee. The Minister of Housing and Local Government, Mr. Henry Brooke, has appointed a Sub-Committee of the Central Housing Advisory Committee under the Chairmanship of Alderman A. F. Bradbeer, with the following terms of reference: 'To review the present arrangements for the management of the housing estates of local authorities and in particular the functions of housing managers, and to make recommendations.'

The other members of the Sub-Committee are Miss A. D. Boyd, Dr. R. Bradbury [*F*], Mr. P. S. Cadbury, Mr. P. L. Leigh-Breese, Mr. K. Marr-Johnson, Professor D. C. Marsh, Dr. A. H. Marshall, Sir Parker Morris, Alderman A. R. Nobes, Councillor H. M. Pattinson, The Dowager Marchioness of Reading, and Mr. F. H. M. Sargent.

Organisations and individuals wishing to submit evidence to the Sub-Committee are invited to write to the Joint Secretaries, Miss M. Empson and Mr. K. Lightfoot, at the Ministry of Housing and Local Government, Whitehall, S.W.1.

International Federation for Housing and Town Planning. A Conference of the International Federation is being held in Berlin from 25 to 30 August in conjunction with the equivalent German national organisation—'Verband für Wohnungswesen, Städtebau und Raumplanung.' The theme of the Conference is to be 'The Acquisition and Planning of Land in Urban Reconstruction.' About 300 delegates are expected to attend.

The discussions will be related to reconstruction work and progress in Berlin and to the Interbau Exhibition (6 July to 29 September). The experiences of different countries in rebuilding town and city centres destroyed during the war will be presented at the Conference and Berlin's own contribution to the programme will be a lecture by the Senator für Bau- und Wohnungswesen, Herr Rolf Schwedler, on 'The Reconstruction of Germany's Capital.'

R.I.B.A. Library Group. At the Annual General Meeting of the R.I.B.A. Library Group on 24 June the following elections, all re-elections, were made: Chairman, Mr. R. E. Enthoven [*F*]; Hon. Secretary, Mr. Kenneth S. Mills [*A*]; and Hon. Treasurer, Mr. W. H. Allen [*A*].

R.I.B.A. Golfing Society. On 11 June the R.I.B.A. Golfing Society played the L.M.B.A. Golfing Society at West Hill Golf Club. The Builders won by 9 matches to 8.

The Summer Meeting of the R.I.B.A. Society took place at Deal on 29 and 30 June. The results were as follows:

The Allensby Bowl: Walter Fisk, 38 points. *The Captain's Prize:* Sir Giles Gilbert Scott, 86 less 14 = 72. *The President's Prize:* Eric Firmin, 36 points. *The Society's Prize:* Felix Wilson, 38 points. Runner-up, Eric Firmin, 35 points.

R.I.B.A. Cricket Club

R.I.B.A. v. The Architectural Association, 12 June 1957. The annual cricket match between the R.I.B.A. and the A.A., which has always been played on the A.A. ground at Elstree, was this year played at Wimbledon on Wednesday 12 June 1957, and turned out to be a very successful innovation.

The A.A. won the toss and batting first, declared at 207 for 3. Mallinson, Nicholls and Sharma all batted well against a varied and steady attack—M. Mallinson, 48; B. Nicholls, 44; S. K. Sharma, 71; K. Kiran, 36 not out. The R.I.B.A. were left two hours and five minutes in which to make the runs, and made a good start through Batty, Case and Holmes, but the wicket began to crumble and the later batsmen, with the exception of Taylor, failed to master Sharma's off breaks. The R.I.B.A. were all out for 153 of which B. Case made 41; R. T. Holmes, 24; G. G. Banfield, 19 and D. Taylor, 19 not out. S. K. Sharma took seven wickets for 74.

R.I.B.A. v. The Vitruvians, 26 June 1957. R.I.B.A.: 101 (R. Case, 38; G. G. Banfield, 30; D. A. Stevens, 20 not out).

Vitruvians: 104 for 8 wickets (R. Hirst, 15; T. Troll, 26; A. Barnett, 20 not out.) Vitruvians won by two wickets.

Obituaries

Sir Ian MacAlister [*Hon. A*] died on 10 June 1957, aged 79.

Sir Ian MacAlister was born in Liverpool in 1878, the second son of Sir John MacAlister, Secretary of the Royal Society of Medicine. He was educated at St. Paul's School and Merton College, Oxford, where he was an exhibitioner in Modern History and took a Second Class in Classical Moderations and Literae Humaniores. From 1902–4 he was Aide-de-Camp and Secretary to Major-General the Earl of Dundonald, who was then G.O.C. of the Canadian Army. During the First World War he served in the Royal Defence Corps as a Lieutenant.

It was in 1908 that Sir Ian was appointed Secretary of the R.I.B.A., in succession to Mr. W. J. Locke, the novelist, where he remained until retirement in 1943.

Sir Ian was knighted in 1934. He was made an Honorary Associate of the R.I.B.A. in 1944, and was also an Honorary Member of the American Institute of Architects.

Sir Percy Thomas, O.B.E., LL.D., M.T.P.I. [Past President], writes:

'To members of the R.I.B.A. of my generation the passing of Sir Ian MacAlister—"Mac" as he was known to the large majority of members—marks the end of an era, an era in which the Institute grew from what was largely a London Society to the great national organisation which it is today.

'The obituary notices of THE TIMES and other papers have paid full justice to the part he

played in the passing of the two Registration Acts, and the development of Architectural Education. In these brief notes, therefore, I would like to pay tribute to the great part he played in making the R.I.B.A. not only a national but an empire-wide organisation (we still used that term in his days).

'In the days immediately after the First World War, Mac gathered around him a group of leading provincial architects, from Scotland, Liverpool, Birmingham, Leeds, Bristol and other centres, who, with Londoners like Paul Waterhouse, Harry Barnes, Stanley Hall, H. M. Fletcher, and many others, were the real driving force, which under Mac's wise guidance reorganised the Council, passed the Registration Acts, and made the R.I.B.A. the power it is today.

'My own acquaintance with Mac began just after the First World War, and from that time through many years on the Council and Committees of the Institute, and as its President, I realise how much I owed to his wise judgment, his counsel and, above all, to his loyalty and devotion to the Institute, which was always his first consideration.

'An example of his devotion to the Institute was that almost his last act before his retirement was to recommend the appointment of Bill Spragg as his successor, advice which the years have so amply justified.

'We of his generation mourn not only the loss of a great Secretary of the Institute, but (and particularly those of us who were privileged to have his friendship) a very great gentleman.'

Mr. H. S. Goodhart-Rendel, C.B.E. [Past President], writes:

'It is hard to write about Sir Ian MacAlister's work at the R.I.B.A., because to those who knew him no description of it can be necessary, and to those who did not know him even the most restrained description may sound over laudatory. Yet I believe that for once the words "beyond all praise" can be used without any exaggeration if applied to his record of service.

'During his long Secretaryship, there came and went in succession many Councils of various moods, and many architects, not less various, successively occupied and vacated the presidential chair. A series of changes, most of them seeming small at the moment, transformed the Institute in necessary accord with a large increase of its size and scope. The policy of the Institute, however, changed not at all; steady always in protecting the interests of architecture both as an art and as an honourable profession, and rejecting all temptation towards combination within that profession for selfish ends.

'As a member of many of the Councils, and as one of the Presidents, in what must be recorded as the MacAlister Age in the history of the Institute, I can testify to what all others having such experience will confirm—the constant availability in the Secretary's office of the guidance and mature wisdom that those in temporary power most need.

'I can also express my gratitude for the precious friendship that resulted from my collaboration with my mentor in many causes that we both had deeply at heart, I might even say fights that we fought side by side. He was as gallant as he was devoted; and, in the field of his labours, his memory deserves enduring honour.'

Mr. C. D. Spragg, C.B.E., Secretary, R.I.B.A., writes:

'Sir Ian MacAlister maintained a lively interest in the affairs of the Royal Institute from the time of his retirement at the end of 1943 until the accident which befell him in February and which caused him so much pain and suffering until his death on 10 June.

'During his retirement he was an avid reader of the R.I.B.A. JOURNAL and the weekly architectural papers. His frequent letters to me showed that he was *au fait* with all that was going on and he was very conscious of the great changes which have taken place and are continuing to take place in the profession. Whether he was in sympathy with present trends is another matter, although I think he realised that the movement towards greater emphasis on what we call, somewhat loosely, the "protective" side of the Institute's work was probably inevitable. Be that as it may, his letters were always a source of great encouragement to his sometimes perplexed successor.

'Others will have written of his great work as Secretary for 35 years. Perhaps the greatest achievement during the period of his Secretaryship was the passing of the Architects' Registration Acts and to this work Mac devoted himself wholeheartedly.

'It is perhaps timely to speak of his efforts to ensure the closest possible links with our members and Allied Societies overseas. This was very close to his heart and I am sad that I shall never be able to tell him of all the affectionate messages which I was charged to give him from old friends in all parts of the world whom the President and I met on our recent tour.

'Mac did not appear to be greatly concerned with the detailed organisation of the office, and the senior members of the staff were given a pretty free hand to run their own departments in their own way. No doubt this is the reason why Mac appeared as a somewhat aloof Olympian figure to those in the less senior positions.

'He had a wholly admirable passion for clear concise English and detested sloppiness and the use of commercial jargon.

'As his second in command from the time of my appointment as Assistant Secretary in 1926 I naturally had close and daily contacts with him. He gave me his confidence and friendship in full measure and I shall always be grateful for all his wise advice and help.'

Henry Ingle Potter [Retd. *A*] died on 22 February 1957, aged 89.

Mr. Potter, after serving his articles with Mr. E. W. Mountford [*F*], went into partnership with Mr. S. W. Cranfield [*F*] in 1902, and practised first in London and later as a partner in the firm of Fowler, Sandford and Potter, in Sheffield, where he was for several years Surveyor to the Sheffield Diocesan Dilapidations Board.

Mr. Potter was joint author with Mr. Cranfield of *Houses for the Working Classes in Urban Districts*, published in 1902.

William Henry Trengrove [*A*] died on 23 March 1953, aged 62.

Mr. Trengrove started private practice in 1923 in Christchurch, New Zealand. Mr. John Trengrove, A.N.Z.I.A. and Mr. Keith Douglas Marshall, A.N.Z.I.A. [*A*], who were subsequently taken into partnership, are continuing the practice of W. H. Trengrove, Trengrove and Marshall.

The practice is a general one involving industrial, commercial, hospital and school work. During Mr. Trengrove's time it included the biscuit factory for Aulsebrook & Co., Auckland, and factories in Christchurch for Associated British Cables Ltd., Tai Tapu Dairy Co., Ltd., and Dunlop N.Z. Ltd.

Notes from the Minutes of the Council

MEETING HELD ON 18 JUNE 1957

Birthday Honours. The congratulations of the Council were conveyed to the members and others on whom The Queen had conferred honours, as announced on page 347.

Appointment of R.I.B.A. Representatives. (*a*) *Ministry of Works National Consultative Council of the Building and Civil Engineering Industries.* Michael Waterhouse [*F*] and E. D. Jefferiss Mathews [*F*] nominated for re-appointment by the Minister of Works. The term of office will in future be three years instead of one year as previously. (*b*) *Council for the Preservation of Rural England.* Peter F. Shepheard [*A*] to fill the vacancy caused by the death of Sir Patrick Abercrombie. (*Note:* G. A. Jellicoe [*F*], appointed by the Council at their meeting on 7 May, was unable to accept appointment.) (*c*) *R.I.B.A. Architecture Bronze Medal: Jury to consider the Award in the area of the Federation of Malaya Society of Architects.* G. E. Magnay [*A*], President, Institute of Architects of Malaya. (*d*) *Professional Classes Aid Council.* Digby L. Solomon [*F*] to fill the vacancy caused by the resignation of Michael Tapper [*F*]. (*Note:* Julian Leathart [*F*], appointed by the Council at their meeting on 9 April, was unable to accept appointment.) (*e*) *Court of the University of Sheffield.* J. Lewis Womersley [*F*] in place of S. Elden Minns [*L*], whose term of office has expired. (*f*) *National House-Builders Registration Council.* A. W. Kenyon [*F*], re-appointed. (*Note:* The other two representatives are Clifford Culpin [*F*] and Miss J. G. Ledeboer [*F*].) (*g*) *National Clean Air* (*Smoke Abatement*) *Society: Annual Conference, Hastings,* 2–4 *October* 1957. R. Duncan Scott [*F*], President, South Eastern Society of Architects. (*h*) *Institute of Materials Handling: Co-ordinating Committee to consider the Dissemination of Knowledge of Materials in relation to Techniques.* E. D. Jefferiss Mathews [*F*]. (*j*) *Southend-on-Sea Borough Advisory Committee for Architecture, Surveying and Building.* A. S. Belcham [*F*] re-appointed. (*k*) *Codes of Practice Committees and B.S.I. Committees:* (i) *B.S.I. Technical Committee CEB/*13: *Mortar Plasticisers.* F. H. Heaven [*A*]. (ii) *B.S.I. Drafting Committee on Proposed Code of Practice on Precautions against Fire.* Eric L. Bird [*A*].

Amendment to Rules: The Norfolk and Norwich Association of Architects. Formal approval was given to amendments to the Rules of the Norfolk and Norwich Association of Architects.

Membership. The following members were elected: as Fellows 14; as Associates 199.

Students. 71 Probationers were elected as Students.

Application for Reinstatement. The following application was approved: as Associate: Robert Jestyn Gwent Forestier-Walker.

Resignations. The following resignations were accepted with regret: John Harold Gibbons [*F*], Miss Joyce Mary Louis Balstone [*A*], Edward Alexander Barrie [*A*], Thomas Coulton [*A*], Miss Patricia Margaret Cox [*A*], Leonard David Harris [*A*], Mrs. Mary Marshall Thomson [*A*].

Applications for Transfer to Retired Members' Class under Bye-law 15. The following applications were approved: as Retired Fellows: Clifford Morris Coombs, Basil Wallis Fitch-Jones, Percy James Westwood, Reginald

Francis Wheatly; as Retired Associates: Peter Relton Coulson Allison, Arthur Hunt; as Retired Licentiate: Captain Harry George Hewitt.

Obituary. The Secretary reported with regret the death of the following members: the Very Rev. Frederick William Dwelly [*Hon. A*], Sir Ian MacAlister [*Hon. A*], Sir Geoffrey Granville Whiskard, K.C.B., K.C.M.G. [*Hon. A*], Professor William Emerson [*Hon. Corr. Member*], Gilbert Henry Jenkins [*F*], George Grey Wornum [*F*], Andrew Edward Angus [*A*], Trevor Straker Bowes [*A*], Walter Ernest Dobson [*A*], Robert Frater [*A*], John Edward Wheeler [*A*], Alfred Ernest Holbrow [*Retd. A*], Frank Edwin Buckley [*L*], Hugh Gault [*L*], Thomas Gibb [*L*], John Peel Nelson [*L*], Frederick Charles Robson [*L*], Percy Roland Hands Satchwell [*L*], William Edward Woolley [*L*], Frederick John Southgate [*Retd. L*], Arthur Williamson [*Retd. L*], David Manning-Sanders [*Student*], Gordon Walter Peach [*Student*].

By resolution of the Council the sympathy and condolences of the Royal Institute have been conveyed to their relatives.

Membership Lists

ELECTION: 18 JUNE 1957

The following candidates for membership were elected on 18 June 1957.

AS FELLOWS (14)

Austin-Smith: (Mrs.) Inette Lotte Edith, A.A.Dipl. [*A* 1947].
Austin-Smith: John Michael, M.C., T.D., A.A.Dipl. [*A* 1947].
Capon: Charles Kenneth, A.A.Dipl. [*A* 1941].
Cocke: Peter Louis, A.A.Dipl. [*A* 1939].
Cooke-Yarborough: Michael Humfrey, A.A. Dipl. [*A* 1940].
Cox: Anthony Wakefield, A.A.Dipl. [*A* 1940].
De Syllas: Leo M., A.A.Dipl. [*A* 1941].
Greenblo: Ezra, B.A.(Arch.) (C.T.) [*A* 1944], Cape Town, S. Africa,
Grice: John Michael, A.A.Dipl. [*A* 1948].
Hickton: Edwin Harry, J.P. [*A* 1934], Walsall.
Madeley: Robert George [*A* 1931], Walsall.
Rosenthal: H. Werner [*A* 1948].
Salt: Geoffrey Wyndham [*A* 1926], Walsall.
Shanks: Donald Allen, Dipl.Arch.(Northern Polytechnic) [*A* 1948].

AS ASSOCIATES (199)

Adeyemi: Adeniyi Adedokun, Goodmayes.
Amberkar: Prabhakar Anant, Bombay, India.
Anderson: Robert James, M.C.D., B.Arch. (L'pool), Liverpool.
Ashcroft: Leslie Thomas, Hove.
Ashton: Stanley, Bath.
Bailey: Keith Latham, Prestwich.
Baker: Ronald Arthur, Burgess Hill.
Ball: Gordon Ainsworth, Congleton.
Bampton: Ian Charles.
Barker: John Ferry, Newcastle upon Tyne.
Barritt: Claude Michael Henry, Dip.Arch. (Sheffield), Colchester.
Baxendale: Eric, Singapore, Malaya.
Beagrie: Alexander Barrie, A.A.Dipl., Coventry.
Beinart: Julian, B.Arch. (C.T.), M.Arch. (Mass. Inst. Tech.), Raleigh, North Carolina, U.S.A.
Belzar: Joseph Alfred, Sidcup.
Bhojraj: Manohar Ganesh, Calcutta, India.
Bishop: Christopher, B.A.(Cantab.), Cheltenham.
Blackwell: David Roy.
Blair: Marshall Bennett, Oadby.
Bloom: David.
Bolt: Peter Bracey, Southsea.
Bouchier: Clive Denzil, Hove.
Bowen: Hayden Trevelyan, Macclesfield.
Brines: Robert Dobson, Surbiton.
Brookes: Clive Colin, Sevenoaks.
Brown: William Kellett, Dip.Arch.(The Polytechnic).
Butler: Jonathan James, Barnet.
Callear: Reginald Peter, Wolverhampton.
Carter: Derek, Dipl.Arch.(Leeds), Bradford.
Cole: Arthur Sidney, Halesowen.
Collins: Lancelot Owen, Watford.
Cox: Alan Dudley, Dublin.
Crick: Thomas, Rochester.
Cross: Jack Anthony, Exeter.
Datta: Krishan Lal, Dehra Dun (U.P.), India.
Davies: Gordon William John, Stevenage.
Dell: Kenneth, Warrington.
Denore: Brian Benedict, Wallington.
Dickie: William Holmes, Motherwell.
Dixon: John Gurney, Chichester.
Down: Peter Ashford, M.A.(Cantab.), Bournemouth.
Dunphy: Thomas Austin, Dublin.
Durrant: James Leo Harold.
Evans: Brian Francis, Liverpool.
Fawden: Roy.
Fielder: David William.
Fineberg: Basil, Preston.
Fisher: Terence Rex, Witney.
Fisk: Roy Alwyn, Swinton.
Flanders: John Frederick, Dipl.Arch.(Northern Polytechnic), Toronto, Ontario, Canada.
Fletcher: Richard Kevin, Preston.
Foster: Bruce Chisholm, Wallington.
Foster: Eric Frank Harvey.
Foster: Michael Patrick Eade, Thames Ditton.
Furze: Rodney Cresswell, Luton.
Garretts: Walter.
Gibson: Robert Findlay, Dip.Arch.(Queensland), Brisbane, Queensland, Australia.
Gifford: Henry Peter, Glasgow.
Goldthorpe: Ian Norman, Kirk Ella.
Gorvin: John Willson, Oxford.
Granelli: (Mrs.) Mary Elizabeth Lambert, Birmingham.
Graydon: Roger Tinsdale, Leeds.
Greenwood: Eric Henry, Birmingham.
Grimpel: Leonard Ronald, Roseville, N.S.W., Australia.
Grimsdale: John Leslie, Harlow.
Grocott: Ronald, Stoke-on-Trent.
Grover: John Frederick Percy, Bromley.
Gumaste: Chandrakant Keshav, Bombay, India.
Hagell: Ralph Edward Jefferys.
Hamilton: Alfred Stanley, Rayleigh.
Hampton: Alan Stacey, Caerphilly.
Hampton: William, Newcastle upon Tyne.
Harding: Kenneth John, Chichester.
Harrison: John Edward Frederick, Newport, Mon.
Haslam: (Miss) Margaret Jill, Bristol.
Hawthorn: Charles Campbell, Warrington.
Headley: William Mills.
Hewlett: (Miss) Margaret Mary, Dip.Arch. (Manchester), Birkenhead.
Heywood: Geoffrey, Poynton.
Holt: Leslie Allan, Altrincham.
Horner: (Miss) June Diane, Andover.
Horwell: Alan Gordon.
Howden: Lionel, Dip.Arch.(Leics.), Hinckley.
Howes: Charles Herbert Duncan, Durban, Natal, S. Africa.
Hulton: (Miss) Margaret McCall, Preston.
Humphrys: Dennis Eric, Orpington.
Hurlin: (Miss) Shona Elizabeth, B.Arch.(Rand), Germiston, Transvaal, S. Africa.
Hutton: Geoffrey Hewland, Lichfield.
Ingram: Leslie Brian, Brookmans Park.
Jessopp: Ian John, Gloucester.
Johnson: Henry Charles, Dover.
Jones: John Brian, Henley-on-Thames.
Jones: William Wilford, Kampala, Uganda.
Kavanagh: Dermot Patrick, Dublin.
Kelly: Simon John, B.Arch.(N.U.I., Dublin), Galway.
Kendrick: Arthur Dudley.
Kerslake: Thomas George, Cheltenham.
King: Alfred Sydney, Beckenham.
Knott: John, Bristol.
Lancon: Roland.
Lee: John Wasdale, Newton Abbot.
Leet: (Mrs.) Lyndall Elisabeth Marion, Belfast.
Leonard: Michael John, Leicester.
Lim: Chong Keat, B.A.(Arch.) (Manchester), New York, N.Y., U.S.A.
Lobo: Austin Malcolm, Lucknow (U.P.), India.
Longley: John Peter, Maidstone.
McCall: Ian Kelso, Paisley.
Mahimkar: Suryakant Govindrao.
Marsden: Thornton Brian, Rochdale.
Mathias: Jon Walter Rodney.
Melville: James, A.R.I.C.S., Morden.
Miller: Edward Joseph William, Beckenham.
Milner: Arthur Robert Garfield, Cambridge.
Morgan: Harry Edmund, Hornchurch.
Mukherjee: Amiya Nath.
Mynot: Frederick Noel, Deal.
Nandhra: Mohinder Singh.
Needham: Philip Rudd, Mansfield.
Nixon: John David, Blaby.
Nott: Colin James, Bampton.
O Byrne: Kevin Hubert, Dublin.
Oldfield: Colin Selwin, Halifax.
Owen: Derrick Roy, Heswall.
Oxley: Ronald Mark.
Parker Jones: Peter Edwin John, Shrewsbury.
Payne: Leonard Frank, Birmingham.
Pearce: John Roger Felton, Audlem.
Peters: John Soley, Chichester.
Petit-Jean: Gerard Maurice, Hatfield.
Pitts: Alan Yate, Walsall.
Plummer: Eric Munro, Seven Kings.
Plummer: Leslie Alfred Derek, Halstead.
Potterton: John Edward, B.Arch.(C.T.), Salisbury, S. Rhodesia.
Prior: Edward George, Hemel Hempstead.
Quinn: Patrick James, B.Arch.(N.U.I., Dublin), Dublin.
Radlett: William Francis, Bromley.
Randall: Cecil Frederick Victor, Burgess Hill.
Rees: Ronald Sterling Lloyd, Guildford.
Reeves: Francis George.
Reid: Hugh McGregor, Georgetown, British Guiana.
Reilly: James Anthony, B.Arch.(N.U.I., Dublin), Bray.
Rey: J. Gustave, Dipl.Arch.(Oxford), Curepipe, Mauritius.
Reynolds: Marius Lawrence, B.Arch.(C.T.), Worcester, S. Africa.
Rhodes: Ephraim Dennis, Cambridge.
Richards: Peter Miles, Biggleswade.
Rose: Hugh, D.A.(Edin.), Gateshead.
Sale: Roy Walter Iven, Billericay.
Sambhare: Gotoo Dwarkanath, Bombay, India.
Saunders: Thomas Walter, Upminster.
Savvides: Nicos Georgiou, Nicosia, Cyprus.
Scarisbrick: Thomas Anthony, Solihull.
Seal: Mervyn Thomas, Bath.
Seaton: Eric, Coleraine.
Seel: Kenneth, Leeds.
Sewell: Ronald Frederick, Tadworth.
Sharp: Charles Richard, Cheltenham.
Short: Orville Peter, Shrewsbury.
Shuttleworth: David, Stockton-on-Tees.
Sibley: William Aubrey, Radlett.
Silcock: Alan.
Sinclair: Derek Cornwall, Horley.
Sinclair: Harold Marrison, Glasgow.
Sloan: William John, East Kilbride.
Smith: Kenneth Raymond, Leicester.
Smith: Terence Walsh, Simonstown, Cape, S. Africa.
Sparrow: Reginald Charles.
Stent: John Arthur, Morden.
Susainathan: Anthony.
Thompson: George Bulwer, Gorleston-on-Sea.

Timpson: John Leonard, Stroud.
Towler: Frederick John, Liverpool.
Toye: Laxman Govindrao, New Delhi, India.
Turner: Raymond Yates, Heckington.
Vallance: Peter John, Woodford Green.
Vanderplank: Richard Edward Walter, M.A.(Cantab.), Dip.Arch.(Birm.).
Van Schaik: Johannes Josephus Arnoldus, Dip. Arch.(Rand.), Pretoria, S. Africa.
Vaughan: George William Brian, Whitchurch, Shropshire.
Veale: Vernon Leslie, Johannesburg, S. Africa.
Wade: Dennis Victor, Eastbourne.
Wager: David Jeremy, Dip.Arch.(Birm.).
Wahnon: Harold Moses.
Walker: (Mrs.) Susan, Dip.Arch.(The Polytechnic).
Weall: Charles Valentine Graham, Chelmsford.
Webster: George Fraser Simpson, D.A.(Edin.), Edinburgh.
Webster: Gerald, Epping.
Welland: John Middleton, B.A.(Arch.)(Lond.), Lagos, Nigeria.
West: Kenneth George, Herne Bay.
Westrope: Keith Leslie, Haverhill.
Whiting: Geoffrey Gilbert, Leek.
Wilcox: Barry Ronald, Wolverhampton.
Wilkinson: Anthony John, M.A.(Cantab.), Houghton.
Wilkinson: George Thomas, Wirral.
Williams: Evan Osborne, B.Arch.(Rand), Umtali, S. Rhodesia.
Wilson: John Leslie, Southampton.
Wimbs: John Beckett.
Wood: Barrie, Alderley Edge.
Wood: John Peter, Wallasey.
Wood: Kenneth, Wolverhampton.
Woodford: Michael Eaton.

ELECTION: 8 OCTOBER 1957

An election of candidates for membership will take place on 8 October 1957. The names and addresses of the candidates, with the names of their proposers, are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, R.I.B.A., not later than Saturday 3 August 1957.

The names following the applicant's address are those of his proposers.

AS FELLOWS (4)

Berbiers: John Louis, Dipl.Arch.(L'pool), Dip.T.P.(Manchester), **A.M.T.P.I.** [*A* 1945], City Architect and Planning Officer, Canterbury, Kent; 22 Queen's Avenue, Canterbury. L. C. Howitt, Sir Lancelot Keay, F. J. M. Ormrod.

Gibson: Donald Evelyn Edward, C.B.E., M.A. (Manchester), **M.T.P.I.** [*A* 1932], County Architect, County Hall, Nottingham; Coppertop, Manor Park, Ruddington, Notts. Professor Basil Spence, Ernest Frear, J. G. Woollatt.

Marshall: Alexander Theodore, D.A., Dip.T.P. (Edin.), A.M.T.P.I. [*A* 1939], Lane's Buildings, Princes Quay, Londonderry; 44, Duncreggan Road, Londonderry. R. H. Gibson, E. D. Taylor, A. F. Lucy.

Smith: Kenneth Reginald, A.A.Dipl. [*A* 1935], 4, Raymond Buildings, Grays Inn, W.C.1; 158, Oaklands Avenue, Oxhey, Herts. Sir Howard Robertson, A. W. Kenyon, R. H. Uren.

AS ASSOCIATES (46)

The name of a school or schools after a candidate's name indicates the passing of a recognised course.

Alexander: Thomas William, D.A.(Edin.), (Edinburgh Coll. of Art: Sch. of Arch.), Caravan Site, Lothianburn, Midlothian, Scotland. E. Riss, Donald Jack, A. C. S. Auld.

Anderson: Thomas Russell, A.R.I.C.S. (Special Final), 'Newtonards', Church Road, Llanblethian, near Cowbridge, Glam. Lewis John, I. J. Lewis, John Hughes.

Artur: Andrzej, (Special Final), 70, Swyncombe Avenue, Ealing, W.5. Thomas Ritchie, R. C. White-Cooper, C. H. Elsom.

Beaumont: James Charles, Dip.Arch.(Birm.), (Birmingham Sch. of Arch.), 34, Highland Road, Leamington Spa, Warwickshire. A. Douglas Jones, Arthur Ling, R. Hellberg.

Bottoms: David Julius, A.A.Dipl. (Arch. Assoc. (London): Sch. of Arch.), 2, Green Acres, Church Street, St. Peters-in-Thanet, Kent. Arthur Korn, C. G. Kemp, Frankland Dark.

Bradley: Guy William, (Arch. Assoc. (London): Sch. of Arch.), 27, Lyndhurst Road, Hampstead, N.W.3. Arthur Korn, H. G. Goddard, R. F. Jordan.

Burnett: (Miss) Rosanna Mary, (Final), Flintwood, Upper Hale, Farnham, Surrey. F. T. Orman, I. F. Roberts, R. D. Scott.

Day: (Miss) Paquita, B.Arch.(Queensland), (Passed a qualifying Exam. approved by the R.A.I.A.), c/o Bank of New South Wales, 47, Berkeley Square, W.1. Prof. R. P. Cummings, T. B. F. Gargett, E. J. A. Weller.

Diprose: Alan, A.A.Dipl. (Arch. Assoc. (London): Sch. of Arch.), 8, Caulfield Road, S.E.15. Arthur Korn, R. F. Jordan, Neville Conder.

Dixon: Roy Rex, (Final), 173, Lewis Flats, Dalston Lane, E.8. T. E. Scott, C. G. Bath, S. F. Burley.

Drake: Henry, (Special Final), Holden Mill House, Haslingden, Lancs. Cecil Stewart and applying for nomination by the Council under Bye-law 3 (*d*).

Eccles: Henry W., Dip. Arch.(Manchester), (Victoria Univ., Manchester: Sch. of Arch.), 2, Pennine View, Barton, Preston, Lancs. Prof. R. A. Cordingley, Dr Thomas Howarth, Dr. W. A. Singleton.

Ellmers: Jack William, (Final), 1, Holland House, Skelmersdale Road, Clacton-on-Sea, Essex. D. W. Clark, R. J. Page, C. W. Box.

Fisher: Geoffrey John, (Final), 3, Gordon Avenue, Gosforth, Newcastle upon Tyne. L. M. Gotch, Arthur Wilkinson, Prof. W. B. Edwards.

Forbes: Brian Keenan, Dip.Arch.(Sheffield), (Univ. of Sheffield: Dept. of Arch.), c/o Westminster Bank Ltd., 233, Westminster Bridge Road, S.E.1. Prof. Stephen Welsh, H. B. Leighton, J. Berger.

Gibberd: Graham Roope, A.A.Dipl. (Arch. Assoc. (London): Sch. of Arch.), 6, St. Simon's Avenue, Putney Hill, S.W.15. Denis Clarke Hall, H. V. Lobb, Arthur Korn.

Grindall: Andrew Maxwell, D.A.(Edin.), (Edinburgh Coll. of Art: Sch. of Arch.), 20, Aldermanhill Road, Dumfries. W. H. Kininmonth, J. R. McKay, Prof. R. H. Matthew.

Hemingway: George Douglas, Dipl.Arch. (Leeds), (Leeds Sch. of Arch.), 4, Cardigan Lodge, 8, Cardigan Road, Richmond, Surrey. F. Chippindale, D. A. Fowler, Kenneth Turner.

Hewetson: William Dickson, (Final), 83, Evington Lane, Leicester. T. W. Haird, C. B. Martindale, Frederick Gibberd.

Hislop: Patrick John, B.A.(Arch.) (Manchester), (Victoria Univ., Manchester: Sch. of Arch.), 23, Frognal Lane, Hampstead, N.W.3. C. H. Aslin, Prof. R. A. Cordingley, Dr. Thomas Howarth.

Ho: Yut Choon, B.Arch. (Catholic University of America) (Arch. Assoc. (London): Sch. of Arch.), 545, Finchley Road, N.W.3. Arthur Korn, H. G. Goddard, R. F. Jordan.

Jellema: Willem Hugo, (Special Final), 29, Hughenden Avenue, Belfast. J. R. Young, R. H. Gibson, E. D. Taylor.

Jordan: Robert Victor, (Final), c/o Messrs. E. R. Collister & Associates, 70, Victoria Street, S.W.1. E. R. Collister, Harold Conolly, Denis Senior.

Kent: Janusz Seweryn, (Special Final), c/o H. G. Payne, Esq., 35, East Street, Bromley, Kent. P. J. Bartlett, J. Holman, A. R. Borrett.

Kirkham: Peter James, (Final), Sunlea, 86, Newcastle Lane, Penkhull, Stoke-on-Trent. J. R. Piggott, C. Knapper, J. A. Pickavance.

Lewandowski: Witold Julian, (Special Final), 32, Gledstanes Road, W.14. Thomas Ritchie, R. C. White-Cooper, A. E. Miller.

Lovegrove: Ralph Liddell, A.A.Dipl. (Arch. Assoc. (London): Sch. of Arch.), 48, Valley Road, Shortlands, Kent. C. H. Elsom, H. V. Lobb, John Ratcliff.

McIntosh: Colin James, B.Arch.(L'pool) (Liverpool Sch. of Arch.: Univ. of Liverpool), 23, Trinity Grove, Bengeo, Hertford. Prof. R. Gardner-Medwin, C. H. Aslin, E. U. Channon.

Maclean: Gordon Hector, B.Arch.(Rand) (Passed a qualifying Exam. approved by the I.S.A.A.), 53, Oakley Street, Chelsea, S.W.3. Applying for nomination by the Council under Bye-law 3 (*d*).

Martin: James Maclean, Dipl.Arch.(Leeds) (Leeds Sch. of Arch.), 14, Wellhouse Road, Barnoldswick, Colne, Lancs. F. Chippindale, D. A. Fowler, Kenneth Turner.

Meeking: Brian David, (Final), 11, Heathway, Vanbrugh Park, Blackheath, S.E.3. Bernard Matthews, R. H. Pastakia, H. N. Dallas.

Moughtin: James Clifford, M.C.D., B.Arch. (L'pool) (Liverpool Sch. of Arch.: Univ. of Liverpool), 42, Tynville Road, Fazakerley, Liverpool 9. Prof. H. M. Wright, Dr. Ronald Bradbury, B. A. Miller.

Page: Anthony Matthews, Dipl. Arch. (Northern Polytechnic) (Northern Poly. (London): Dept. of Arch.), 240, Finchley Road, Hampstead, N.W.3. T. E. Scott, C. G. Bath, S. F. Burley.

Park: Allan Thomas, (Final), 65, Wentworth Way, Sanderstead, Surrey, J. S. Walkden, R. J. Hurst, C. S. White.

Payne: (Miss) Janet Evelyn Churchill, Dipl. Arch. (Northern Polytechnic) (Northern Poly. (London): Dept. of Arch.), Robin Hill Cottage, Queens Road, Bournemouth. T. E. Scott, A. W. Kenyon, A. F. Burley.

Pratt: Robert, (Special Final), 12, Cornwall Close, Maidenhead, Berks. J. N. Meredith, Guy North, G. J. Cuzens.

Reid: George, D.A.(Edin.) (Edinburgh Coll. of Art: Sch. of Arch.), 33, Fishers Road, Port Seton, East Lothian, Scotland. J. R. McKay, Prof. R. H. Matthew, David Carr.

Serjeant: Denis Lee Talbot, (Final), The Priory, Iffley, Oxford. Reginald Cave, David Beecher, Thomas Rayson.

Silcock: David Donald Joseph, B.Arch.(L'pool) (Liverpool Sch. of Arch.: Univ of Liverpool), West Lodge Cottage, Meols Drive, West Kirby, Wirral, Cheshire. Prof. R. Gardner-Medwin, Prof. H. M. Wright, G. B. Drury.

Soanes: Bryan Horace, (Final), 71, Botley Road, Oxford. David Booth, Reginald Cave, F. T. Pritchard.

Speirs: Cunningham Alexander, Dip.Arch. (Birm.) (Birmingham Sch. of Arch.), c/o Messrs. Birch & Caulfield, 45, Newhall Street, Birmingham, 3. A. Douglas Jones, T. M. Ashford, D. A. Lumsden.

Town: Kenneth Richard, (Final), 28, Queen's Crescent, Edinburgh, 9. Prof. H. M. Wright, Prof. R. H. Matthew, J. Holt.

Watrach: Kazimierz Wladislaw, (Special Final), 145, Elborough Street, S.W.18. Thomas Ritchie, K. L. Sharpe, A. E. Miller.

Willder: Peter Sims, (Final), Lodge Drive, Belper Lane, Belper, Derbyshire. E. H. Ashburner, C. F. W. Haseldine, H. H. Dawson.

Young: Hugh Alexander, (Special Final), 39, St. Chad's Road, Sutton Coldfield, Warwickshire. Stuart Bentley and applying for nomination by the Council under Bye-law 3 (*d*).

Zadziuk: Mieczyslaw Karol, (Special Final), 2, Kingston Terrace, Leeds, 2, Yorks. F. Chippindale, Thomas Ritchie, D. du. R. Aberdeen.

ELECTION: 5 NOVEMBER 1957

An election of candidates for membership will take place on 5 November 1957. The names and addresses of the overseas candidates, with the names of their proposers, are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, **R.I.B.A.**, not later than Wednesday 16 October 1957.

The names following the applicant's address are those of his proposers.

AS FELLOW (1)

Chowdhury: Jugal Kishore, Dip.T.P.(Lond.), A.M.T.P.I. [*A* 1949], Consulting Architect to Government of Punjab, U.S. Club Building, Simla, India; 8, Benmore, Simla. A. S. Patil, H. N. Dallas, M. K. Jadhav.

AS ASSOCIATES (3)

The names of a school or schools after a candidate's name indicates the passing of a recognised course.

Gordon: Ronald Percy, B.Arch.Dip.T.C.P. (Sydney) (Passed a qualifying Exam. approved by the R.A.I.A.), 17, Abbotsford Road, Homebush, Sydney, N.S.W., Australia. Prof. Denis Winston, J. A. Kerr, W. R. Laurie.

Hirst: Michael James, A.A.Dipl. (Arch. Assoc. (London): Sch. of Arch.), Tema Development Corporation, P.O. Box 23, Tema, Ghana. H. C. Inglis, Arthur Korn, Guy Morgan.

Slaven: Anthony Noel Errol, B.Arch.(Rand) (Passed a qualifying Exam. approved by the I.S.A.A.), 1006, Cavendish Chambers, Jeppe Street, Johannesburg, S. Africa. Applying for nomination by the Council under Bye-law 3 (*d*).

Members' Column

This column is reserved for notices of changes of address, partnerships vacant or wanted, practices for sale or wanted, office accommodation, and personal notices other than of posts wanted as salaried assistants for which the Institute's Employment Register is maintained.

APPOINTMENTS

Mr. Godfrey S. Henman [*A*] has been appointed Architect to the Western Welsh Omnibus Company Limited, 253 Cowbridge Road West, Cardiff, and will be pleased to receive trade catalogues.

Mr. R. W. Hewison [*A*] has resigned from his appointment as Town Planner in the Department of Local Government, Sydney, and has accepted an appointment as Property Officer with the Australian Stevedoring Industry Authority, Sixth Floor, Hosking House, Penfold Place, Sydney, New South Wales, Australia.

Mr. James Wilson Henry Murdoch [*A*] has been appointed Lecturer in Architecture at the Nigerian College of Arts, Science and Technology, Zaria, N. Nigeria.

Mr. R. Derek Norris [*A*] has taken up an appointment with Messrs. Mitchell & Mitchell & Partners of P.O. Box 187, Wellington, C.1, New Zealand.

Mr. F. I. Shackleton [*A*] has been appointed Assistant District Architect for the Province of Nova Scotia, Canada, for the Department of Canada. His address is now D.P.W., Federal Building, P.O. Box 425, Halifax, N.S., Canada.

PRACTICES AND PARTNERSHIPS

Mr. Arthur J. Ardin [*A*] has taken **Mr. Clive C. Brookes** [*A*] into partnership, and the practice will be continued at 129 Mount Street, London, W.1. (GROsvenor 7738) under the title of **Ardin and Brookes.**

Messrs. T. P. Bennett and Son (Sir Thomas Bennett, K.B.E. [*F*], P. H. P. Bennett [*F*], M. L. Winslade [*F*], W. B. Galloway [*A*], G. W. Bowes [*A*]) have taken **Mr. Michael Metcalfe** [*A*] and **Mr. W. Howard Sant** [*A*] into partnership and will continue to practise under the same style at 43 Bloomsbury Square, London, W.C.1.

Mr. Graham Law [*A*] and **Mr. James Dunbar-Nasmith** [*A*] have gone into partnership and have opened an office at 54 Frederick Street, Edinburgh, 2.

Mr. Kenneth A. Morgan [*A*] and **Mr. Ronald E. Carn** [*A*] are now practising together under the style of **Morgan and Carn** from Hove and Eastbourne, and will be glad to receive useful technical literature at their office at 12 Grand Avenue, Hove, Sussex.

Mr. James Taylor [*F*] of 196 West Regent Street, Glasgow, C.2, has taken **Mr. Wm. T. Davie** [*A*] into partnership. The firm will continue to practise at the same address under the style of **Taylor and Davie.**

Mr. Alan Thompson [*A*] has begun practice at Queens Chambers, 6–7 Victoria Parade, Torquay (Torquay 7766), where he will be pleased to receive trade catalogues.

Mr. V. S. van Langenberg [*L*] has taken **Mr. R. A. Hewish** [*A*] into partnership. The practice will continue under the style of **T. C. van Langenberg and Son** at the same address, Lee Rubber Building, P.O. Box 64, Kuala Lumpur, Malaya.

Mr. Herbert G. West [*A*] and **Mr. Robert E. G. Miller** [*A*] have commenced private practice under the style of **West and Miller** at Fechney Buildings, 59 Glasgow Road, Perth, where they will be pleased to receive trade catalogues, etc.

CHANGES OF ADDRESS

Mr. D. J. Baber [*A*] has changed his address to c/o Education Division, United States Operations Mission, Federal Compound, Tripoli, Libya.

Mr. Ian Bowen Bravery [*A*] has changed his address to P.O. Box 8081, Causeway, Salisbury, Southern Rhodesia.

Mr. E. L. Crawford [*A*] has changed his address to 30 Burns Road, Pound Hill, Crawley, Sussex.

Messrs. A. E. O. Geens and M. G. Cross [*FF*] have changed their address to Metropole Chambers, The Lansdowne, Bournemouth (Bournemouth 5201).

Mr. N. H. Godsmark [*A*] has changed his address to 37A Tubwell Row, Darlington, Co. Durham.

Messrs. J. Mansell Jenkinson and Son [*F/A*] have changed their address to 53 Wilkinson Street, Sheffield, 10 (Sheffield 65241–2).

Messrs. Stewart Kaye and Poole [*AA*] have changed their address to 60 Castle Street, Edinburgh, 2.

Mr. Bernard Lamb [*A*] has moved his office to 57 Beauchamp Place, London, S.W.3 (KNIghtsbridge 0697).

Mr. R. D. Ottewill [*A*] has changed his address to 30 Melbourne Court, Welwyn Garden City, Hertfordshire.

Mr. O. Evans Palmer [*A*] has changed his address to The Old House, London Road, Horsham, Sussex.

Messrs. Parker and Roberts [*AA*] of 47 Silver Street, Lincoln (Lincoln 11371/2), now have their branch office at 16a Southgate, Sleaford, Lincs (Sleaford 350), open full-time. **Mr. John L. Burnett** [*A*], the assistant in charge, will be pleased to receive trade catalogues, etc.

Mr. Edgar F. Stevens [*A*] has now opened a small branch office at 95, Hersham Road, Walton on Thames (Walton on Thames 8875), and would be pleased to receive trade catalogues at that address.

Mr. Gordon H. F. Thompson [*A*] has changed his address to 205 Upper Woodcote Road, Caversham, Reading, Berks. (Reading 71328).

Mr. W. Norman Twist [*F*] has changed his address to 68 Thornhill Road, Streetly, Sutton Coldfield (Streetly 7357).

Mr. J. H. Pavitt [*A*] has changed his address to Lincoln House, 37 St. Germain's Road, Forest Hill, London, S.E.23.

PRACTICES AND PARTNERSHIPS WANTED AND AVAILABLE

Associate (50), with wide industrial and general experience at home, Brazil and Tanganyika, having left Tanganyika owing to recession, requires partnership with probationary period if required. Small amount of capital available. Educated at public school and Edinburgh School of Architecture and Town Planning. Box 51, c/o Secretary, R.I.B.A.

Experienced Associate with industrial and private connections seeks partnership in an existing practice in or near Somerset. Some work in hand and substantial commission pending. Some capital available. Box 52, c/o Secretary, R.I.B.A.

Old established chartered architect's practice (with substantial clients) for sale in London area. Box 53, c/o Secretary, **R.I.B.A.**

WANTED AND FOR SALE

Wanted. Mrs. M. Joan Wilson [*A*], Librarian of the Leeds School of Architecture, is anxious to acquire the ARCHITECTURAL REVIEW of January, February and May, 1955. Will any member who would be willing to part with these please write to the Librarian, Leeds School of Architecture and Town Planning, 43a Woodhouse Lane, Leeds, 2.

The Royal Institute of British Architects, as a body, is not responsible for statements made or opinions expressed in the JOURNAL.

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